SHOUT
SHARE
IT

18
2
17

REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

VOL. IV.

Smithsonian Institution
SEP 1 1917
241484
National Museum

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

VOL. IV.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
THE IMPERIAL BUREAU OF ENTOMOLOGY,
89, QUEEN'S GATE, LONDON, S.W. 7.
1916.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

VISCOUNT HARCOURT, *Chairman.*

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Entomology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.
Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.
Dr. Guy A. K. Marshall.

Assistant Director.
Mr. S. A. Neave.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.7.
Publication Office.—89, Queen's Gate, London, S.W.7.

ERRATA.

Page	11	line	50	for	“*Culicada milsomi*”	read	“*Culicada milsoni*”
,,	12	,,	1	,,	“Annual Report for 1914”	,,	“Annual Report Veterinary Dept. Gold Coast for 1914.”
,,	13	,,	15	,,	“*Goniocetes compar*”	,,	“*Goniocotes compar*”
,,	18	,,	39	,,	“*rhodiesense*”	,,	“*rhodesiense*”
,,	23	,,	25	,,	“Ser. A,”	,,	“Ser. B,”
,,	24	,,	25	,,	“**желудѣ**”	,,	“**желудкѣ**”
,,	25	,,	41	,,	“Pirnsky”	,,	“Pirussky”
,,	33	,,	45	,,	“*Clitellus*”	,,	“*Citellus*”
,,	46	,,	26	,,	“1 lb.”	,,	“1 gal.”
,,	51	,,	32	,,	“Roberg”	,,	“Rchberg”
,,	80	,,	18	,,	“*Ornithodoros*”	,,	“*Ornithodorus*”
,,	145	,,	43	,,	“*Azelia*”	,,	“*Azelaria*”
,,	154	,,	38	,,	“*D. albipectus*”	,,	“*D. albipictus*”
,,	159	,,	34	,,	“Dyar (H. C.)”	,,	“Dyar (H. G.)”
,,	179	,,	4	,,	“*tapetiella*”	,,	“*tapetzella*”
,,	183	,,	11	,,	“*Sylvius*”	,,	“*Silvius*”

VOL. IV. Ser. B. Part 1.—pp. 1-16. JANUARY, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

Smithsonian Institution
FEB 24 1916
National Museum

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., *Chairman.*

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.

Mr. Guy A. K. Marshall.

Assistant Director.	Assistant Editor.
Mr. S. A. Neave.	Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—27, Elvaston Place, London, S.W.

IMPERIAL BUREAU OF ENTOMOLOGY.

REVIEW
OF
APPLIED ENTOMOLOGY.

SERIES B.

Institution 24 1916 Museum

VOL. IV.] [1916.

BISHOPP (F. C.) & LAAKE (E. W.). U.S. Bur. Entom. **A Preliminary Statement Regarding Wool Maggots of Sheep in the United States.** —*Jl. Econ. Entom., Concord*, viii, no. 5, October 1915, pp. 466-474.

The wool maggots, although pests of importance to sheep-owners, have received practically no attention from investigators in the United States. In the Southern States, *Phormia regina* is active throughout the winter, though it may disappear for a few days during cold periods; it usually reaches its greatest abundance in the early spring, diminishing as hot weather comes on. In the northern part of the country, this fly is absent during the coldest weather, but is to be found in large numbers during the spring and autumn, and in the extreme north is abundant throughout the summer. The adults of *P. regina* emerge when the temperatures are moderate in autumn and spring. In Texas, infestations occur from the beginning of lambing, which is about 1st December, to shearing time, from April to June. The cessation of injury is due to some extent to the diminution of the numbers of the fly, and especially to the removal of the wool. *Lucilia sericata* occurs throughout the year in the Southern States, except in the coldest seasons of the winter. It is not so plentiful, however, in late autumn, early spring and in warm periods in mid-winter as is *P. regina*. The adult *Lucilia* does not appear as early in the spring as that of *P. regina*. Reproduction does not often take place in winter, even in the extreme South. The adults are present throughout the summer, though they often diminish in numbers during excessively hot and dry periods. In Texas, the winter is passed in the larval and pupal stages in the soil or beneath carcases. *L. sericata* has a wide distribution in North America. It is more closely associated with human habitations than *P. regina* or *Chrysomyia macellaria* and is seldom seen far from houses. In order to mitigate the injury due to these pests, it is essential that greater care be exercised in destroying the carcases of animals or burying them under at least two feet of earth. Treatment with borax and other chemicals is not as satisfactory as burning. To prevent infestation of the sheep after lambing, this should occur in winter whenever practicable. Strains of hornless sheep should be developed

(C232) Wt.P.12/91. 1500. 1.16. B.&F.Ltd. Gp.11/3.

in the United States, as the chances of injury are thereby reduced. In treating infested sheep, the wool should be trimmed so as to allow the insecticide full access. The trimming should be begun round the outside of the infested area so as not to drive the maggots back into the clean wool. A Hymenopterous parasite, probably *Nasonia brevicornis*, Ashm., has been found to breed freely in a number of carrion-infesting flies, including *P. regina*, *Lucilia sericata* and *L. caesar*. Other parasites have been reared, but this is the most important one. [See also this *Review*, Ser. B, iii, pp. 159–162.]

BUCKLAND (J.). **The Value of Birds to Man.**—*Jl. R. Soc. Arts., London*, lxiii, no. 3284, 29th October 1915, pp. 999–1000.

The increase in numbers of *Margaropus annulatus* (Texas-fever tick) in Jamaica during recent years is synchronous with the decrease of insectivorous birds. In each of the 4 stages in the life-history of this tick, it is exposed to the attack of birds. Examination of the stomach contents of one bird showed the presence of 74 adult female ticks in an engorged condition. The island of Jamaica is remarkably suitable for the breeding of cattle, but experience has shown that all imported animals succumb to tick-fever. It is therefore essential that, in some way, the insectivorous birds should be encouraged to increase.

LÜTJE (—). **Durch Fliegen und ihre Larven verursachte Erkrankungen.** [Diseases caused by Flies and their Larvae.]—*Deutsch. Tierärzt. Wochenschr., Hannover*, xxiii, no. 46, 13th November 1915, pp. 395–397, 7 figs.

In the summer of 1915 the plague of flies of various sorts in the western theatre of operations was more serious than in the previous year and the treatment of flesh wounds was complicated by their presence. Myiasis in horses and cattle was also prevalent. An almost epidemic disease of the external genitals made its appearance among cows. A number of the larvae concerned were bred and proved to be those of *Wohlfartia* (*Sarcophaga*) *magnifica*. A similar disorder, having probably the same cause, has been found in ewes.

COTTON (E. C.). **The North American Fever Tick** (*Boophilus annulatus*, **Say.**)—*Tennessee Univ. Agric. Expt. Sta., Knoxville*, Bull. no. 113, March 1915, pp. 33–77, 15 figs., 13 tables. [Received 29th September 1915.]

The original Federal quarantine line was established along the northern boundary of the region permanently infected with Texas fever. In the eastern part of America this line followed closely the isotherm of 59° F. In the more arid regions of the south-west it bent sharply southward along the line of 60 per cent. humidity. Sporadic outbreaks of fever occurred north of this line at irregular intervals, always following the introduction of southern cattle. The parasitic stages of *Margaropus* (*Boophilus*) *annulatus* are little affected by change of air temperature. They require 7 to 9 days for larval engorgement, 5 to 10 days for nymphal engorgement and 4 to 14 days for the adult.

The non-parasitic stages vary with season and temperature. The pre-oviposition period varies from 2 to 56 days, the oviposition period from 9 to 122 days. Engorged adults are negatively phototropic. The rate of oviposition varies with the temperature. Engorged adults exposed to temperatures of 24° F. or lower may be killed by freezing. Under dry conditions, they will survive at lower temperatures. Experiment showed that all eggs exposed to a temperature of 2° F. were killed. Within the humid portion of the tick area, humidity is probably not an important factor in larval longevity when the eggs hatch during the same season as they are laid. The average longevity of larvae hatching from overwintering eggs is 94 days, that of larvae from eggs hatching before winter is 176 days. Larvae are able to survive the ordinary winter temperatures of the tick area, except along the northern border. A temperature of 4° F. is fatal to all larvae.

CHAPIN (R. M.). **Studies on Changes in the Degree of Oxidation of Arsenic in Arsenical Dipping Baths.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 259, 13th July 1915, 12 pp., 2 figs., 7 tables. [Received 5th October 1915.]

The changes taking place in the arsenic compounds of dipping fluids are essentially brought about by the growth of micro-organisms, other factors being relatively of little importance. As the result of experiments carried out by the author during 1913, the following conclusions were reached :—(1). No amount of arsenic which can reasonably be used in a dipping bath is sufficient to retard to any appreciable degree the rate of oxidation or of reduction, though a longer time is required for the complete oxidation of a large amount of arsenic than for a small amount. (2). Under conditions favourable to reduction, the action may progress with extraordinary rapidity, far overbalancing any simultaneous opposing action of oxidising organisms. In such cases however the reducing organisms soon exhaust either their vitality or the medium and thereafter are unable successfully to oppose the action of the oxidising organisms. As soon as the dipping fluid is used, oxidising and reducing organisms, together with nutrient matter for either or both of these, are added. Frequent and abundant use of the bath favours reduction; limited and infrequent use favours oxidation.

Further experiments upon the effectiveness of certain antiseptics against the activity of the organisms gave the following results :—(1) flotation of a millimetre of paraffin oil on the surface of dipping baths during periods of disuse will measureably retard oxidation by decreasing the rapidity of the diffusion of oxygen into the fluid ; (2) cresylic acid, in admissible amounts, partially inhibits the growth of oxidising organisms, a conclusion borne out by practical experience with proprietary dips containing this substance; (3) formaldehyde is an effective antiseptic against both classes of organisms and does not interfere with analytical methods for the determination of arsenic.

The experiments of 1914 were directed to the determination of the practical applicability of formaldehyde as a preservative against oxidation of dipping fluids in the vat. It was found that formaldehyde solution (37 per cent.) used in the proportion of 1 gal. to every 1,500 gals. of fluid in the vat was a safe and effective means of reducing oxidation to a low figure. Since there seems to be no evidence that oxidation is ever likely to progress so far as to result in injury to cattle, the question of the use of formaldehyde is purely an economic one. In most cases it will probably be cheaper to allow some of the arsenic to be wasted by oxidation.

Bishopp (F. C.). **Fleas.**—*U.S. Dept. Agric., Washington, D.C.*, Bull. no. 248, 14th August 1915, 31 pp., 9 figs.

Fleas in the adult stage are almost exclusively parasitic on warm-blooded animals. Adults normally feed once a day or possibly oftener. Certain species show a marked tendency to infest certain portions of the host, and in the case of inoculation of an animal with plague bacilli by a flea, it has been observed that there is a relationship between the point of attack and the formation of the swellings. The number of eggs deposited by a single female varies with the species, the abundance of food and climatic conditions. The egg-stage lasts from 2 to 12 days. The food of the larvae of nearly all species consists partly of blood voided by the adult, partly of particles of animal or vegetable origin. The total period from the deposition of the egg to the emergence of the adult, in tests with the dog flea conducted during the summer at Washington, ranged from 17 to 35 days. A table showing the relative lengths of the life-cycle of fleas in different countries is given. This duration is influenced by food, temperature and humidity. [See this *Review*, Ser. B, ii, pp. 62–64.] In nearly all cases breeding places are closely associated with the resting places of the host. A marked seasonal variation is shown in the abundance of fleas in any country. In the United States human fleas are prevalent during the summer. In India there is a marked decrease in numbers at the approach of the hot season. Variation from year to year is due to weather conditions ; in the United States years of greatest abundance may coincide with a summer rainfall which is above the normal. In those portions of the country where mild winters and comparatively humid summer conditions prevail, fleas are most abundant. Sandy soil is most suitable for breeding, as it provides the most uniform conditions of moisture. The movements of fleas are of little importance in spreading the species. Dispersal is effected by the movement of the host, by the scattering of the eggs and by the carriage of adults or immature stages in merchandise.

The following species are capable of carrying bubonic plague :—*Xenopsylla cheopis*, Roth. (Indian rat flea), *Ceratophyllus fasciatus*. Bosc. (European rat flea), *Pulex irritans*, L. (human flea), *Leptopsylla musculi*, Dugès (European mouse flea), *Ctenocephalus canis*, Curtis (dog flea), *C. felis*, Bouché (cat flea), *Hoplopsyllus anomalus*, Baker, and *Ceratophyllus acutus*, Baker (squirrel fleas), *C. anisus*, Roth., and *Pygiopsylla ahalae*, Roth. (rat fleas). The human flea is largely dependent on man as a host, although in Europe it seems to thrive on the badger and in the United States is commonly found on the skunk. Pigs and rats also serve as temporary hosts. *Echidnophaga gallinacea* (chicken flea) is widely distributed in the tropics and warm temperate regions. In the United States it occurs in the southern and south-western parts, and appears to be spreading. *Dermatophilus penetrans*, L. (chigger flea), occurs in Florida, West Indies, Mexico, South America, East Africa and Madagascar.

Natural means of control are afforded by hot, dry weather, the direct rays of the sun in summer and excessive moisture in the breeding places. Certain Staphylinids prey on the adults, and in Texas, ants attack the eggs and larvae. Among artificial methods, the use of alum has given good results in China. This substance is added to the whitewash or calcimine used on the walls, paper is dipped in a solution of alum and put under rugs and matting, and powdered alum is sprinkled on carpets or other floor covering and swept in. Light traps have been used in certain cases against the adults. These traps consist of a tumbler three parts full of water with about an inch of olive oil on the top on which a wick floats. This is set in the middle of a soup plate filled with strong soapsuds and placed on the floor of the bedroom at night. As a repellant, oil of pennyroyal is widely used. Menthol, camphor, 3 per cent. solution of carbolic acid and hydrogen peroxide relieve the inflammation caused by the bites.

Richardson (C. H.). **Fly control on the College Farm.**—*Rept. Entom. Dept., New Jersey Agric. Coll. Expt. Sta., for 1914, Paterson*, 1915, pp. 382–399. [Received 12th November 1915.]

Investigations during 1914 were largely directed to a study of the fly fauna of a typical New Jersey farm, especially of those species which frequent milk and are thus possible carriers of infectious diseases. The work on larvicides was continued with a view to discovering new materials and to formulating new methods of control. Milk-baited traps were regularly visited between May and October by the following species:—*Calliphora erythrocephala*, Meig., *Lucilia sericata*, Meig., *Phormia regina*, Meig., *Musca domestica*, L., *Muscina stabulans*, Fall., and *Fannia canicularis*, L. Less abundant species were:—*Ravinia communis*, Parker, *R. latisetosa*, Parker, *Sarcophaga bullata*, Mans., *S. haemorrhoidalis*, Meig., *S. helicis*, Town., *Pollenia rudis*, F., *Cynomyia cadaverina*, Desv., *Lucilia caesar*, L., *Morellia micans*, Macq., *Graphomyia americana*, Desv., *Muscina assimilis*, Fall., *Ophyra leucostoma*, Wied., *Fannia scalaris*, F., and *Scatophaga stercoraria*, L. An effort was made to locate the breeding places of the different species. Judging by the number of species bred, cow manure was the most important producer of flies, chicken manure the least important. Under ordinary conditions, horse manure breeds the largest numbers of house-flies. The latter also hatched from cow, pig and chicken manure. They did not breed in cow manure in the field, but only when it was mixed with straw. Chicken manure offered a breeding place for house-flies only when moist. About one-half the species which were regularly attracted to milk were bred from various kinds of manure and are therefore liable to be a source of contamination to milk when it is improperly protected.

The work on larvicides consisted largely of an attempt to find new chemicals suitable to control house-fly larvae in manure. None of the compounds except borax, iron sulphate and mercuric chloride were effective at the strengths tested. Mercuric chloride is a violent poison at the strength of 1 part to 50 of water, but is too expensive for general use. None of the three compounds was of sufficient strength to kill all the larvae and some always reached the pupal stage. One apparently healthy adult emerged from a borax and iron sulphate dish. Outdoor experiments with iron sulphate showed that the larvae can be killed if this substance is carefully mixed with the manure. Surface treatment of manure heaps with iron sulphate does not result in total elimination of the larvae. The fertilising value of the manure did not appear to be seriously harmed. Pyroligneous acid had no effect on any stages of development. Fly breeding in horse stables was practically eliminated by the use of iron sulphate. No breeding was observed to take place in old compost heaps. Ammonia was not given off from these in a perceptible quantity, nor did they possess the characteristic odour of fresh manure. These observations suggest that the female fly may be attracted to fresh manure either by the odour of ammonia or by the fœcal odour. Experiments conducted at a time when flies were abundant indicated that the attractiveness of ammonia was slight. Alcohol extract of manure was attractive to larger numbers of flies than water or ether extract, because it contained the largest quantity of the compounds which produce the fœcal odour, namely, skatol and indol; these substances deserve a trial as baits for fly traps, although their present cost would probably limit their use to dilute solutions.

All manure from horse and cow sheds was placed daily in cement pits and these were emptied; with a few exceptions, at least once a week. Chicken manure, in the one instance in which it was infested by larvae, was treated with unslaked lime and water, which raised the temperature to 140° F. and killed the larvae. This procedure cannot be recommended, as it undoubtedly drives off most of the ammonia from the manure. Sulphur was used for fumigation against adult flies on a number of occasions.

HEADLEE (T. H.). **Report on the Mosquito Work for 1914.**—*Rept. Entom. Dept., New Jersey Agric. Coll. Expt. Sta., for 1914, Paterson*, 1915, pp. 401–466. [Received 12th November 1915.]

During 1914 considerable attention was devoted to salt-marsh mosquito control. The long-continued low temperature at the beginning of the season delayed the development of the early spring brood. The principal species in this brood was *Aedes cantator*, Coq., but in the southern parts of the State it was associated with *A. sollicitans*, Wlk. In wooded areas, this brood remained in evidence for about eight weeks. From the emergence of the early brood until the 15th July, the number of mosquitos from the drained salt-marsh was negligible and the number from the undrained marshes only normal. After this date the tides became high and did not resume their former level until 25th July. A second brood occurred towards the end of this period. The members of this brood which emerged from the undrained and incompletely drained marshes spread through the pines and farm land for more than 30 miles from the coast. The brood which issued during the latter half of July from the undrained marshes of South Jersey was augmented and replaced by later ones and continued troublesome throughout August and September.

Large numbers of *Culex pipiens*, L., and *C. salinarius*, Coq., hatched out about the middle of July from the polluted marshes of north-western Newark Bay. The flights of *C. pipiens* from the breeding places only ceased when these dried up owing to the weather and additional drainage. A detailed account of the drainage work carried out in 1914 is given.

MASON (F. E.). **Report of the Veterinary Pathologist.**—*Ann. Rept. for 1914, Veterinary Service, Ministry of Agric., Egypt, Cairo,* 1915, pp. 24–40. [Received 7th October 1915.]

During 1914 cases of a disease having the characteristics of East Coast fever were detected in Sudanese cattle. The disease always declared itself within three weeks of the date of arrival. No cases were found in Sudanese cattle which had been kept longer than that period in quarantine. Systematic collection of ticks from the cattle at various points on their journey showed that, even before arsenical dippings were carried out at Halfa, the species of ticks capable of carrying East Coast fever did not often remain on the cattle further north than Luxor and were rarely found on arrival at Cairo. In affected cattle, Koch's blue bodies were found in the spleen, lymphatic glands, liver and kidneys. The author hesitates to diagnose the disease as East Coast fever, on the ground that these bodies are apparently not specific of this fever. In Egyptian fever, a disease affecting cattle, bodies indistinguishable from Koch's bodies have been found, and the disease at the same time presents peculiarities sufficient to differentiate it from East Coast fever. A form of piroplasmosis occurs in Sudanese sheep in which similar blue bodies are found. It has also been encountered in Syrian and Egyptian sheep and has been reproduced from the latter by blood inoculation into lambs. In the majority of cases of Egyptian fever, the course of the disease resembles that of Texas fever. Observations during the past three years show that the disease is widespread in Egypt, being apparently more prevalent in Lower Egypt, and occurring also among Sudanese cattle. Fatal cases of Egyptian fever are rarely met with. The blood may show a heavy infection, 80 to 90 per cent. of the corpuscles containing four or five parasites each. Haemoglobinuria has been observed. Autopsy shows minute ulcers in the intestine, enlarged lymph glands and frequently an enlarged spleen. The species of tick associated with outbreaks of this fever is *Margaropus annulatus.*

Experiments on the subcutaneous injection of virulent cattle plague blood to produce immunity were continued, with the result that doubly inoculated cattle were proved to withstand the injection of doses ranging from 2 to 10 cc. at periods of two and two and a half years after the date of their immunisation. Up to the present no animal has developed cattle plague out of 731 tested in the above way, although some developed Texas or Egyptian fever.

CASTELLANI (A.) & JACKSON (T. W.). **Notes on certain insecticides.** —*Jl. Trop. Med. Hyg., London,* xviii, no. 22, 15th November 1915, pp. 253–255.

The results of a number of experiments carried out in Serbia are given. The substances found to be efficient against *Pediculus humanus*, L., (*corporis*, de Geer) in order of efficiency, were: Kerosene oil, vaseline, guaiacol, anise preparations, iodoform, lysol, cyllin and similar preparations, carbolic acid solution, napthaline and camphor. Pyrethrum has a very feeble action on lice, while boric acid, corrosive sublimate and zinc sulphate, when used in powder form, have apparently no action whatever. This was also the case with precipitated sulphur in powder form, even when mixed with sebaceous human secretion. Kerosene oil was the best for bed-bugs and guaiacol comes next. Substances which have a powerful action on lice, may have little or no action upon bed-bugs and *vice versa.* Iodoform kills lice within 10–15 minutes, but bed-bugs may live for more than 24 hours when exposed to it; it has also very little effect on fleas. Pyrethrum, on the other hand, has a much more powerful action on bed-bugs than on lice. For use against lice on a large scale, such as among troops and prisoners, naphthaline is perhaps the best insecticide. For the better class of patients, menthol powder is to be preferred to naphthaline in most cases, as its odour is not displeasing, while it is repellent to mosquitos, in addition to lice and fleas; it is especially useful in summer and in hot countries, as it has a cooling effect on the skin and often prevents prickly heat.

McEachran (J. F.) & Hill (G. F.). **Investigations into the Cause of Worm Nodules (*Onchocerca gibsoni*) in Cattle, at Darwin, Northern Territory, Australia.**—*Melbourne,* [1915], 8 pp. [Received 3rd November 1915].

Investigation of cattle at Darwin showed that almost every individual was infected with worm nodules, the buffalos alone appearing to be exempt.

The following blood-sucking insects have been recorded in the vicinity of Darwin:—Tabanidae: *Tabanus gregarius,* Erich., *T. nigritarsis,* Taylor, *T. lineatus,* Taylor, *T. cinerescens,* Macleay, *T. brevivitta,* Walk., *Silvius sordidus,* Taylor; Muscidae: *Stomoxys calcitrans,* L., *Lyperosia exigua,* de Meijere; Chironomidae: *Culicoides subnitidus,* Skuse; Culicidae: *Ochlerotatus* (*Culicelsa*) *vigilax,* Skuse, *O. annulirostris,* Skuse, *Anopheles* (*Myzorhynchus*) *bancrofti,* Giles, *Taeniorhynchus* (*Chrysoconops*) *acer,* Walker; Anoplura: *Haematopinus tuberculatus* Burm.; Ixodidae: *Margaropus* (*Boophilus*) *australis,* Fuller. Experiments were performed to test whether imported cattle free from *O. gibsoni* could become infected by grazing with infected cattle and to ascertain the rôle played by insects in carrying *O. gibsoni.* The following conclusions were reached:—(1) Local cattle may become infected with worm nodules a few months after birth. Cattle from Victoria, where nodules are very rarely present, may, by grazing with infected cattle, become infected within six months. No evidence can be adduced regarding the mode of infection. (2) The housing arrangements of calves were such that biting and flying insects had ready access to the animals. The fact that they were not affected during the seven or eight months period of exposure indicates that the intermediate host is not a biting or flying insect, and even an ordinary skin parasite, such as *Haematopinus tuberculatus,* which travels a short distance, may be eliminated. (3) The negative results obtained point to the probability of the intermediate host being in the ground. The pens were floored with concrete and the experimental calves had no opportunity of lying on ground where infected cows had previously been. Part of the life-history of the parasite may be passed on or in the ground.

It is suggested that a series of experiments on similar lines should be commenced at a later period of the year, from June to December. Such experiments would determine whether cattle become infected at a period when biting flies are not numerous. A special study should be made of the biting flies of the territory, particular attention being paid to those which attack buffalo and also terrestrial insects which may be possible vectors.

DIGUET (L.). **Nouvelles observations sur le mosquero ou nid d'araignées sociales employé comme piège à mouches dans certaines localités du Mexique.** [Further observations on the mosquero or nest of gregarious spiders used as a fly-trap in some localities of Mexico.]—*Bull. Soc. Nat. Acclimat., Paris,* lxii, no. 8, August 1915, pp. 240–249, 4 figs.

Coenotele gregalis, E. Simon, is the spider whose nest is employed as a fly-trap in certain parts of Mexico [see this *Review*, Ser. B, iii, p. 151]. The Drassid spider, *Poecilochroa convictrix*, E. Simon, and a minute Clavicorn beetle, *Corticaria nidicola*, Grouv., are commensals. Where the latter was absent, its place was taken by migratory ants, which perform the same duties of cleaning the nest. *P. convictrix* attacks the larger victims in the web.

LAVERAN (A.). **Comment le bouton d'Orient se propage-t-il?** [How does Biskra boil spread?]—*Ann. Inst. Pasteur, Paris,* xxix, no. 9, September 1915, pp. 415–439.

Man and certain animals can be inoculated with Biskra boil, which often develops on accidental lesions of the skin and can be conveyed by infected towels. As the boils appear on those portions of the body which are not clothed, winged insects seem to be the carriers; mosquitos and *Phlebotomus* being especially under suspicion; bed-bugs have also been suspected. It is quite possible that biting insects may play an important rôle, not by directly inoculating the virus, but by causing minute lesions which serve as entrances for it. In countries where the disease is endemic, the house-fly seems more adapted for conveying *Leishmania* than blood-sucking insects, though conveyance would be purely mechanical, as *Leishmania tropica* does not appear to develop in the house-fly. As regards an animal reservoir of the virus, the dog, alone, seems likely to play this rôle in regions where cutaneous canine Leishmaniasis is common, as at Teheran. Elsewhere, the patients seem to form the sole reservoir of the virus. *L. tropica* may include varieties and transmission may differ in different zones of endemicity, and this may explain why observations carried out in India do not agree with others made in Algeria. The foot-notes to this paper include 67 references.

STEDEFEDER (—). **Der Bremsenschwindel der Schafe** (*Oestrus ovis*). [Sheep staggers (*Oestrus ovis*).]—*Berliner Tierärztl. Wochenschr., Berlin*, xxxi, no. 46, 18th November 1915, pp. 541–544, 3 figs.

In 1860 there were 28 million sheep in Germany; these decreased to rather more than five million in 1913, in which year the total wool imports amounted to £21,750,000. Owing to the restriction of imports due to the war, the prevalence of sheep staggers, which was particularly noticeable in 1915, is a serious matter. Oestrid larvae were present in some mild cases of staggers which took the form of a catarrh and ended with the expulsion of the larvae. In some other cases, in which a severe meningitis was present as well as a catarrh, no larvae were found in the brain capsule, though bacteria were abundant. The meningitis must be therefore considered to be due to bacteria and not to Oestrid larvae, which have hitherto been thought to be the causal agents. A bibliography of six works is given.

Bekämpfung der Läuse in Pferdebeständen: Merkblatt für die preussische Armee. [Combating lice in horse lines: Instruction sheet for the Prussian army.]—*Berliner Tierärztl. Wochenschr., Berlin*, xxxi, no. 46, 18th November 1915, p. 547

The following preparations have proved successful in killing lice on horses:—(1) Grey mercury ointment, not more than 150 grains at each application, may be rubbed in either alone or mixed with oil or soft soap; it must be brushed over the whole body with the horse-brush, care being taken near the eyes; (2) an infusion of tobacco (1 to 25 or 30) with or without the addition of vinegar—this is poisonous; (3) a mixture of 1 part petroleum to 10 of methylated spirit or equal parts of petroleum and rape-seed oil; (4) a 2 to 3 per cent. solution of creolin in water or a 3 per cent. solution of liquor kresoli saponatus; both these solutions must be brushed in; (5) Sabadilla vinegar, 1 : 20—this is poisonous and should be well rubbed in at strongly infested spots only; (6) fish oil may be used in the same way as (5); (7) in case of need the horse may be washed with soapy water and while the coat is still damp, finely sifted beech ashes or peat ashes may be dusted on and well brushed in. To prevent the eggs from hatching, infested spots should be repeatedly washed with vinegar, which will dissolve the egg-shells. All the above are sufficient to kill the lice, but in obstinate cases, arsenicals may be resorted to. In any case, success depends on repeated applications, at five-day intervals. Where the horse lines are permanent, the exercise of cleanliness in every direction will contribute to a satisfactory result.

TAYLOR (F. H.). **Half-yearly Reports from 1st July to 31st December 1914 and from 1st January to 30th June 1915.**—*Australian Institute of Tropical Medicine, Townsville, Queensland*, 10 and 11 pp. [Received 27th October 1915.]

As the result of an expedition to the northern ports of Queensland, the expenses of which were met by a grant of £100 from the Quarantine Department, with the object of mapping the distribution of *Stegomyia fasciata*, F., it was found that this mosquito occurs in all the ports of North Queensland, especially Normanton and Thursday Island. A new species of *Culex* was found in Normanton and the distribution of several known forms considerably extended. *Aedes* (*Skusea*) *uniformis*, Theo., previously known from India was found in Cairns. Many of the species collected at Port Darwin were previously known only from Southern Australia, and three species had not previously been recorded from the mainland, namely, *Hodgesia triangulata*, originally described from Papua, *Ochlerotatus* (*Reedomyia*) *pampangensis* from the Philippine Islands, and *Taeniorhynchus* (*Chrysoconops*) *aurites* from West Africa, the Philippines and China, thus connecting the mosquitos of Australia with those of the East. Among those from Port Douglas, were the male of *Anopheles* (*Myzorhynchus*) *barbirostris* var. *bancrofti* and the new species of *Culex*, which has spotted wings. Experiments are in progress to determine the life-cycle of *Stegomyia fasciata*, as it is of great importance to know this for different periods of the year in view of a possible outbreak of yellow fever in Queensland. The following species were collected :—From Port Darwin: *Anopheles barbirostris* var. *bancrofti*, Giles, *Anopheles* (*Nyssorhynchus*) *annulipes*, Walk., *Stegomyia fasciata*, F., *S. scutellaris*, Walk., *Mimeteomyia* (*S.*) *hilli*, Taylor, *Pseudoskusea basalis*, Taylor, *Macleaya tremula*, Theo., *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse, var., *O.* (*Reedomyia*) *pampangensis*, Ludlow, *O.* (*Culicelsa*) *vigilax*, Skuse, *O.* (*C.*) *paludis*, Taylor, *O.* (*Culex*) *occidentalis*, Skuse, *Culex fatigans*, Wied., *Culex tigripes*, Grp., *C. sitiens*, Wied., *Mansonioides* (*Taeniorhynchus*) *uniformis*, Theo., *Taeniorhynchus brevicellulus* (*Chrysoconops acer*, Walk.). *T.* (*Chrysoconops*) *aurites*, Theo., *Aedes* (*Skusea*) *funerea*, Theo., and *Hodgesia triangulata*, Taylor.

From Port Douglas: *A. barbirostris* var. *bancrofti*, *A. annulipes*, *S. fasciata*, *O. vigilax*, *C. fatigans*, *Culex* sp. n.

Additional species collected by the author in northern ports, included :—*Mucidus alternans*, Westw., *Mimeteomyia atripes*, Skuse, (*S. punctolateralis*, Theo.), *Pseudoskusea basalis*, Taylor, *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse, *Macleaya tremula*, Theo., *Finlaya poicilia*, Theo., *Aedes* (*Skusea*) *funerea*, Theo., and *A.* (*S.*) *uniformis*, Theo.

In the second half year, investigation into the spread and distribution of *S. fasciata*, *C. fatigans* and *A. annulipes* were completed. *S. fasciata* is prevalent in the coastal towns, *C. fatigans* is not so widely distributed, while *A. annulipes* was absent in some places.

The ticks collected comprised specimens of *Margaropus* (*Boophilus*) *australis*, Fuller, *Amblyomma triguttatum*, Koch, and *A. trimaculatum*, Luc., the two latter being from reptiles. A collection sent by Dr. E. W. Ferguson of Sydney contained specimens of *Culex frenchi*, Theo., *Ochlerotatus* (*Culicada*) *cumpstoni*, Taylor, and *O.* (*Culicada*) *annulipes*, Taylor, which had previously been recorded from New South Wales. Specimens of *Mimeteomyia atripes*, Skuse, a species described in 1888, were discovered by Dr. Ferguson at Milsom Island, and by Mr. W. A. Thompson at Blackheath, New South Wales.

In addition to the routine work, a paper was published entitled: "Contributions to a knowledge of Australian CULICIDAE, No. 11," which contains the descriptions of the following new mosquitos :—*Mimeteomyia* (*Stegomyia*) *quasiornata*, *Neomacleaya australis*, *Culex mossmani* and *C. normanensis* from Queensland, and *Culicada milsomi* from New South Wales, besides additional records for previously known forms. The male of *Anopheles barbirostris* var. *bancrofti* is also described for the first time.

Beal (W. P.). **Annual Report for 1914.**—*London*, 1915, 18 pp., 3 plates, 9 tables, 1 map. [Received 2nd November 1915.]

Glossina sp., *Tabanus taeniola*, *T. biguttatus*, and a number of undetermined Tabanidae were captured during the year. An epidemic of verminous enteritis occurred among sheep brought from Senegal. The worms found in the stomach were *Spiroptera microstoma* or *macrostoma* (*Habronema muscae*) and are transmitted by the house-fly. The embryos of the worm pass out with the faeces and then enter the bodies of fly larvae which have hatched from eggs deposited on the dung or moist litter. The young worm reaches its final stage of development about the time the adult fly emerges. The worm passes out of the fly on to the horse when the former settles on the muzzle or the body, is licked in by the horse and passes into the stomach. It lives on the mucous membrane and also burrows channels in it.

Seidelin (H.). **Distribution and Prevalence [of Yellow Fever].**—*Yellow Fev. Bur. Bull.*, *Liverpool*, iii, no. 4, August 1915, pp. 259–260. [Received 12th November 1915.]

The number of yellow fever cases reported during the years 1913 and 1914 show a marked decrease. During the past four years, the only large epidemic outbreak occurred in Tocopilla, Chile, in 1912. No endemic focus of any importance has been eradicated during the years of observation, except possibly in Northern Brazil. Renewed investigations tend to confirm Sir Rubert Boyce's contention that a widespread endemic prevalence of yellow fever is present in West Africa, and it is probable that similar investigations in other yellow fever countries will lead to similar results.

Seidelin (H.). **Town Planning in the Tropics with special Regard to the Prevention of Yellow Fever.**—*Yellow Fev. Bur. Bull.*, *Liverpool*, iii, no. 4, August 1915, pp. 260–266. [Received 12th November 1915.]

An efficient prophylaxis against yellow fever consists in a complete extermination of the transmitting mosquitos. As long as there is any doubt as to whether one or several species, in addition to *Stegomyia fasciata*, are able to act as transmitters, it is advisable to destroy all mosquitos. These, in the first instance, should be prevented from gaining access to quarters inhabited by non-immunes. The simplest method is the screening of such quarters. The problem of the segregation of a European settlement in connection with a native town is discussed, and the British and Spanish methods of town-planning shortly described.

Herrick (G. W.). **Some external Parasites of Poultry, with special Reference to Mallophaga, with Directions for their Control.**—*Cornell Univ. Agric. Expt. Sta.*, *Ithaca, N.Y.*, Bull. 359, April 1915, pp. 233–268, figs. 95–116. [Received 18th November 1915.]

The presence of lice on domestic fowls causes an irritation which eventually weakens the host and gives opportunity for further diseases to attack the bird. The incubation period of the eggs seems to vary considerably; in *Menopon pallidum* hatching probably occurs in from 6 to 10 days after oviposition, while in *Nitzschia pulicaris* from 13 to 20 days are required. The adult of *M. pallidum* has been kept alive for 9 months. A list of species of Mallophaga infesting various domestic fowls is given, including:—*Menopon pallidum*, Nitzsch (common hen louse), *M. biseriatum*, Piaget (large hen louse), *Lipeurus variabilis*, Nitzsch, *L. heterographus*, Nitzsch, *Goniocotes hologaster*, Nitzsch (lesser chicken louse), *G. gigas*, Tasch. (large chicken louse), and *Goniodes dissimilis*, Nitzsch, on *Gallus domesticus*; *Lipeurus jejunus*, Nitzsch, *L. anseris*, Gurlt, *Docophorus icterodes*, Nitzsch, and *L. squalidus*, Nitzsch, on the goose; *Goniodes stylifer*, Nitzsch, and *L. polytrapezius*, Nitzsch, on the turkey; *Goniodes pavonis*, L. (*falcicornis*, Nitzsch), on the peacock; *Lipeurus baculus*, Nitzsch, and *Goniocetes compar*, Nitzsch, on the pigeon. Less common species are: *Trinoton luridum*, Nitzsch, on the duck, *T. conspurcatum*, Nitzsch, and *T. lituratum*, Nitzsch, on the goose, and *Menopon phaeostomum*, Nitzsch, on peafowl.

Dermanyssus gallinae, de Geer (the poultry mite), has been reported from England, France, Italy, South Africa, Brazil, and all parts of the United States. The incubation period of the eggs varies from 3 to 5 days. Several generations occur during the warm season. *Ceratophyllus gallinae* and *Echidnophaga gallinacea* (fowl fleas), *Trombidium* sp. (harvest mite) and the tick, *Haemaphysalis chordeilis*, Pack., which infests turkeys, are also recorded. The last-named species has been recorded in Massachusetts and Vermont, where the death of turkeys has occurred as the result of their attacks. The species may be the same as the one which infests grouse in these districts. Methods for controlling these parasites are described. [See this *Review*, Ser. B, iii, pp. 158 and 159.]

Наставленіе для истребленія платяныхъ вшей. [Instructions for the destruction of clothes-lice.]—**«Извѣстія Всероссійскаго Союза Городовъ.»** [*Bulletins of the All-Russian Union of Towns*], *Moscow*, no. 18, October 1915, pp. 58–60.

These instructions, issued by the Military Sanitary Board, recommend the destruction of lice by the application of high temperature to infested clothes, etc. As this is not always practicable on active service in the field, resort must be had to chemical remedies, of which the best is: a mixture of 65 parts of naphtha-soap with 35 parts of technical cresol or, in the absence of this, with 10 per cent. of crude carbolic acid in a 10 per cent. water solution (a 10 per cent. solution of the naphtha and cresol soaps is obtained by dissolving 30 lb. of them in 27 gallons of water). Lice in linen are destroyed by soaking it in one of the above solutions and hanging it out to dry. Clothes are brushed with a brush moistened in the above solutions, particularly along the seams and folds, and after the cloth has dried it may be brushed again so as to remove the dead parasites. The application of this solution is a safeguard against the parasites for some time.

Scott (J. W.). **Insect Transmission of Swamp Fever.**—*Science, Lancaster, Pa.*, xlii, no. 1088, 5th November 1915, p. 659.

During the summer of 1914, a case of swamp fever was obtained experimentally by the author, and the conditions of the experiment showed that the disease was contracted through the agency of biting insects. This serious and destructive blood disease of the horse has been reported from France, Germany and Japan, and is widely distributed in North America. It occurs from near sea-level to at least 9,000 feet, usually in swampy regions, but has been also reported from wooded districts. The disease shows a seasonal distribution, reaching a maximum in late summer or early autumn. In France it was supposed that natural transmission was by drinking water contaminated with urine or faeces from an infected horse. Experiments conducted at Wyoming in this direction during 1912–13 gave negative results. Later investigations carried out by the author in the attempt to find some external agent which acted as a carrier of the disease led him to the belief that the stable-fly [*Stomoxys calcitrans*] was responsible for transmission. This conclusion was based on the following reasons: (1) Stable-flies were observed to attack the horses repeatedly and in large numbers; (2) negative results of other experiments showed that mosquitos were not responsible; (3) house-flies do not bite, and other flies present in the experimental cages did not attack the horses so far as could be observed.

Fuschini (C.). **Ancora sulla distruzione delle mosche.** [A further note on the destruction of flies.]—*Riv. Vitic. Enol. Agrar., Conegliano*, xxi, no. 18, 15th September 1915, pp. 425–426.

To destroy flies, bread, in slices from $\frac{1}{5}$ to $\frac{2}{5}$ of an inch thick, dried in the sun to increase its absorbent properties, is soaked in a 10 per cent. solution of commercial formalin to which a little milk has been added. The slices are laid on plates or pieces of paper, in the places where the flies are most abundant. Within a quarter of an hour the flies begin to die; owing to the action of formalin, the bodies dry rapidly without putrefying.

Carpano (M.). **La febbre della costa Mediterranea; Piroplasmosi tipo "parvum" nei bovini del basso bacino del Mediterraneo.** [Mediterranean coast fever; piroplasmosis of the "*parvum*" type in cattle of the lower basin of the Mediterranean.]—*Ann. Igiene Speriment., Turin*, xxv, no. 4, 1915, pp. 343–410, 18 figs., 2 plates.

In the Italian colony of Libya, as in the whole lower basin of the Mediterranean, a disease of cattle occurs which is especially serious in imported animals; the symptoms resemble those of African East Coast fever and tropical piroplasmosis. It is stated to be due to *Theileria parva* and *Piroplasma annulatum*, and is called Mediterranean Coast fever by the author, who was sent by the Italian Ministry of War to study it. On the coast of Libya the natives are not acquainted with this fever, owing to its very mild and sporadic character in the indigenous animal. Imported cattle, chiefly those from regions where the disease does not occur, are the most affected. Serbian cattle imported for the troops became infected about 30 days after their arrival and some died in a few days ; in no case did the native animals, among which they had been placed, suffer in any way. Piroplasmosis did not, however, occur in imported animals which were kept segregated from native animals, in localities free from ticks. Animals from Tunisia, Sardinia and south Italy, under the same local conditions, only contracted the disease in a mild form. Young animals are more susceptible than old ones and females more than males. The epizootic began in spring and reached its maximum in July—the time of year when ticks are most abundant. The losses were considerable, as most of the infected animals died. Among the Serbian cattle, the disease affected about 100 per cent. of the animals and resulted in a mortality of about 90 per cent. The parasites concerned are described, viz :—(1) *Theileria parva* vel *Piroplasma parvum* vel *P. bacilliforme*, the agent of Rhodesian fever or African Coast fever, which is considered identical with the one studied by the author in Eritrea ; (2) *Piroplasma annulatum* vel *P. tropicum*, the agent of tropical piroplasmosis or Transcaucasian piroplasmosis. The disease is transmitted by a tick, which is almost certainly *Hyalomma aegyptium*, the only Ixodid commonly met with on the Libyan coast, where it also infests horses, mules, donkeys and camels ; on these animals, as on cattle, it is found only in the adult stage. The larval and nymphal stages are passed, according to some authors, on wild animals, probably on a squirrel, *Funambulus palmarum* and on a hare, *Lepus nigricollis*. As two species of parasite are associated in causing the disease, *H. aegyptium* must, for the present, be held to transmit both of them, as no other tick was observed. Experimental transmission by means of infected blood was the subject of many tests and, among other results, they confirmed the fact that both the micro-organisms in question are simultaneously concerned in the disease. The restriction of imports to those breeds of cattle which are least susceptible is one of the preventive measures advised, while others aim at isolation from sources of tick-infestation.

RODHAIN (J.) & HOUSSIAU (J.). **Dermatite vésiculeuse saisonnière produite par un coléoptère.** [A seasonal vesicular dermatitis caused by a beetle.]—*Bull. Soc. Path. Exot., Paris.* viii, no. 8, 13th October 1915, pp. 587–591, 1 fig., 1 plate.

In April and May 1915, an epidemic of vesicular dermatitis occurred at Leopoldville, Belgian Congo. It was caused by the irritant secretions of a small Staphylinid beetle, but was rapid and benign in character and yielded to treatment with zinc ointment. Natives appeared to be less attacked than Europeans. It is also stated that, according to Da Silva, *Paederus columbinus*, Lap., which is common in Brazil, causes an acute dermatitis in that country.

In the discussion on this paper, M. Roubaud stated that similar symptoms are produced in Tropical Africa by various Cantharid beetles, including *Cantharis flavicornis*, Duf., and *C. vestita* Duf., in Senegal.

Rodhain (J.) & Villeneuve (J.). *Passeromyia*, **genre nouveau des Anthomyidae (Dipt.), à larve hématophage.** [*Passeromyia*, a new genus of Anthomyiidae with a haematophagous larva.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 8, 13th October 1915, pp. 591–593.

A new genus, *Passeromyia*, is erected and described for *Muscina heterochaeta*, Villen. (*Bull. Soc. Entom. France*, no. 14, 28th July, 1915, p. 225). This species is very common in Africa, from the tropics southward, and the larvae have been found to attack many nestling birds, including those of various Ploceidae, *Cinnyris cupreus*, and species of *Hirundo*. It belongs to the sub-family, Muscinae, whereas *Phormia sordida*, the larvae of which has similar habits [see this *Review*, Ser. B, iii, p. 122] belongs to the Calliphorinae.

In a note to this article, it is pointed out that confusion has arisen among some authorities between *Phormia sordida*, Zett. (*Lucilia dispar*, Dufour) and *Phormia* (*Protocalliphora*) *azurea*, Fall. The authors agree with Rondani and Zetterstedt in treating these as two distinct species.

Bequaert (J.). **Note rectificative concernant les Auchméromyies du Congo.** [A rectification relating to *Auchmeromyia* from the Congo.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 8, 13th October 1915, pp. 593–594.

The example of *Choeromyia choerophaga*, Roub., recorded from the N.E. corner of the Belgian Congo [see this *Review*, Ser. B, iii, p. 197] is stated to have been erroneously identified and to be in fact a female of *Cordylobia anthropophaga*, Blanch.

d'Anfreville (L.). **Note historique à propos des moustiques agents de transmission des maladies.** [A historical note on mosquitos as carriers of disease.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 8, 13th October 1915, pp. 594-595.

An official French report, dated 24th August 1818, records the fact that all the Europeans taking part in the first expedition to Upper Senegal were provided with pieces of cloth to protect them against mosquitos, because the sleeplessness due to mosquito bites was one of the chief predisposing causes of mortality among Europeans on the river.

Martini (E.). **Ueber drei weniger bekannte deutsche Kuliziden:** *Aëdes ornatus*, **Meig.;** *Mansonia richardii*, **Fic., und** *Anopheles* (*Coelodiazesis*) *nigripes*, **Stäger.** [On three little-known German mosquitos.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzig*, xix, no. 22, November 1915, pp. 585–607, 10 figs.

The three mosquitos, *Ochlerotatus* (*Aedes*) *ornatus*, *Taeniorhynchus* (*Mansonia*) *richardii* and *Anopheles nigripes* are described in this paper. Larvae of *O. ornatus* and *A. nigripes* were found in water in hollow trees near Hamburg, Lübeck and Rostock; the females of the former are easily caught near the breeding places. *T. richardii* was abundant near Hamburg early in July 1914.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.
Sheep Flies in the U.S.A. 1
Birds as Destroyers of Ticks in Jamaica 2
Myiasis in Cows caused by *Wohlfartia magnifica* in Germany .. 2
The Bionomics of *Margaropus annulatus* in the U.S.A. 2
The Changes in the Degree of Oxidation of Arsenic in Dips .. 3
Notes on Fleas in the U.S.A. 4
The Control of House-Flies in New Jersey 5
Report on the Mosquito Work for 1914 in New Jersey 6
Ticks and Tick-borne Cattle Diseases in Egypt 7
Experiments against Lice and Bed-bugs in Serbia 7
The Prevalence of *Onchocerca gibsoni* in Australia 8
The Use of a Spider's Nest as a Fly Trap in Mexico 9
The Method of Transmission of *Leishmania tropica* 9
The Cause of Staggers in Sheep in Germany 10
The Control of Lice on Horses in Germany 10
Mosquitos of Northern Australia 10
Biting Flies and Intestinal Worms on the Gold Coast 12
The Distribution and Prevalence of Yellow Fever 12
Measures against Yellow Fever in Tropical Towns 12
Parasites of Poultry in the U.S.A. 12
The Destruction of Lice in Russia 13
Transmission by Insects of Swamp Fever in Horses in the U.S.A. 14
Bread soaked in Formalin as a Fly Trap 14
Piroplasmosis of Cattle in the Mediterranean 14
A Staphylinid Beetle causing vesicular Dermatitis in Man in the Belgian Congo 15
A New Genus of Flies parasitic on nestling Birds in Africa 16
Cordylobia anthropophaga from the Belgian Congo 16
An early Record of Measures against Mosquitos in Senegal .. 16
Three little-known Mosquitos in Germany 16

VOL. IV. Ser. B. Part 2.—pp. 17-32. FEBRUARY, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., ***Chairman.***

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.
Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.
Mr. Guy A. K. Marshall.

Assistant Director.
Mr. S. A. Neave.

Assistant Editor.
Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—27, Elvaston Place, London, S.W.

Ligue Sanitaire Française contre la mouche et le rat. [French sanitary league against the fly and the rat.]—Circulars and Bulletins issued April 1914 to September 1915. Offices, 72, Rue de Rome, *Paris.*

This Society was founded on 21st February 1914 with the object of directing popular attention to the losses caused by diseases which are so far preventible in that they are carried by animals and insects, the destruction of which would very materially limit their spread. The president of the Society is Professor R. Blanchard, the Ministers of Agriculture, the Colonies, Commerce, Finance, War, Marine and the Interior are honorary presidents and the honorary committee comprises a number of well known French savants.

The following publications have already been issued :—The first bulletin (April 1914) consists of a report of the inaugural meeting. The second (July 1914), besides a report of the second meeting held on 22nd June 1914, contains reprints of articles from a number of important French newspapers urging the public to support the League, explaining its objects and pointing out the great value of the work which it seeks to accomplish. The third bulletin (20th February 1915), is entitled "La lutte contre les poux" [the struggle against lice] from the pen of Professor Blanchard, being intended for the assistance of soldiers in the field. A brief popular description of the three species of lice usually infesting human beings and of the manner in which they spread is given. Soldiers are warned that lice are the carriers of recurrent fever and exanthematous typhus, and a very practical chapter is devoted to methods of destruction. The use of ointments is not recommended, as they often irritate the skin and soil the clothing; applications of camphorated alcohol, or warm vinegar containing 1 per 1,000 of corrosive sublimate, infusion of pyrethrum powder, petrol or benzine are recommended. The use of these lotions should be repeated two or three days later as the eggs are not killed by them. Against body lice it is sufficient to change the clothing and spray the garments with benzine. Motor spirit used with a sponge and followed by a hard brush, especially along the seams, is efficacious; even tobacco smoke blown under the clothing through a rubber tube is very useful, though it does not kill the eggs. Anisol at 3–5 per cent. kills both lice and eggs almost immediately, but the cost is prohibitive. Members of a disinfection staff are advised to wear long overalls and brush their hands and arms with camphorated alcohol; in the trenches, the straw should be renewed as often as possible and the fouled straw burned; all woodwork should be sprayed with cresyl.

The fourth bulletin, also by Professor Blanchard, deals with the disposal of the dead in war time, and the Japanese method as carried out in Manchuria is described and illustrated. Dr. R. D. de la Rivière contributes an article on the danger to men of various parasites. Another paper sets forth a sketch of a campaign against flies, and the use of the cinematograph is strongly urged in order to convince uneducated people of the actuality of the danger from flies. "Pure water and no insects" is the title of another paper.

The fifth bulletin (25th August 1915) is entitled "La lutte contre la mouche" [the struggle against the fly], with 25 figures, and deals with the general character and bionomics of the more important Dipterous pests. On the battle-field *Calliphora erythrocephala,* *Musca domestica* and *Muscina stabulans* oviposit on corpses soon after death and before putrefaction has set in; *Lucilia latifrons* and *Sarcophaga carnaria* are attracted by putrefaction; flies of the genus *Phora* do not make their appearance until later. The regulations of the sanitary authorities of various English and American towns are translated at length and the latest work on the treatment of manure heaps is given very fully. In an appendix by H. G. Richter a detailed description, with 2 figures, is given of an installation for the keeping of manure by placing it on gratings over a concrete floor to catch the runnings which are led into a tank fitted with a pump so that they may be thrown again on to the heap in order to destroy the larvae in it; the manure should not be piled higher than about five feet. This bulletin of 62 pages constitutes an excellent general review of the whole subject and the author appears to have availed himself of the latest information obtainable up to the date of publication.

In addition to these bulletins, two circulars have been issued, one giving general advice as to how to rid premises of flies, and the other a description, with figures, of a folding food-safe. The popularisation of knowledge and information of this kind should do much to assist the sanitary authorities in their work.

Reports of the Sleeping Sickness Commission of the Royal Society, no. xvi, *London*, 1915, 221 pp., 32 charts, 16 plates, 3 maps.

This report is largely a recapitulation of matter which has already been published. The examination of wild animals in the Sleeping Sickness Area in Nyasaland showed that about one-third of the antelopes investigated were infected with various trypanosomes. The same trypanosomes were also found in the wild animals living in the fly-belt of the Upper Shiré valley, to the south of the Proclaimed Area. An examination of smaller mammals, including monkeys, gave negative results. Wild game living outside the fly-country were found to be unaffected by pathogenic trypanosomes. *Glossina morsitans* was found to be heavily infected with the same species of trypanosomes as those found in the blood of the wild game. The other important species of tsetse-fly found in Nyasaland, *G. brevipalpis*, was infected with the same trypanosomes, and it is considered probable that it is as capable of spreading disease as *G. morsitans*. The trypanosomes with which the wild game and the fly were infected were:—*T. brucei* vel *rhodiesense*, *T. pecorum*, *T. simiae*, and *T. caprae*. The opinion is expressed that *T. brucei*, the cause of nagana in Zululand and in other parts of Africa, is identical with *T. rhodesiense*, causing disease in man in Nyasaland and Rhodesia. *T. pecorum*, the commonest of the pathogenic trypanosomes in Nyasaland, affects cattle and other domestic animals, and is probably the most important and dangerous species of all those which affect the stockowner. A new species, *T. simiae*, is described; it is remarkable for the rapidity with which it kills domestic pigs.

On account of the marked infectivity of the wild game in the fly-country, the Commission recommends that efforts be made to diminish, as far as possible, the number of wild animals in fly-areas. On the hypothesis that the tsetse-fly finds its chief food supply in wild game, any diminution in these animals would lead to a corresponding diminution in the number of flies. It is recommended that all restrictions be removed regarding the pursuit and killing of wild game in fly-areas. The natives should be permitted to use their own methods and should be provided with a certain number of guns. The removal of infected natives into fly-free areas is suggested, as this would avoid the necessity for segregation camps. The clearing of forest round villages is considered useful, as it helps to keep the fly away from the village proper, lets in sunlight and air and keeps wild animals at a distance. For purposes of administration it is advisable to collect natives into fairly large villages, rather than allow them to live in single huts scattered through the bush. Prophylaxis and treatment of the disease by drugs is at present considered to be of little or no practical use.

It is asserted that this problem cannot be attacked with any chance of success from the side of the fly alone. The fly-country in Nyasaland comprises some 5,000 square miles, much of which is thinly populated. The opinion is expressed that it is quite impracticable to lessen the number of flies to any material extent by destroying them or their pupae, and that when the country becomes opened up, the big game will disappear and the flies with them.

Garden (G.). **Nyasaland Protectorate.**—*Ann. Rept. Dept. Agric. for the year ending 31st March 1915, Veterinary Div., Zomba,* 1915, pp. 29–32.

An outbreak of trypanosomiasis in the Fort Johnston district resulted in the death of a large number of animals, and the abandonment of Fort Johnston as a Government cattle station was consequently advised. It was found that the two tsetse areas formerly divided by the river had apparently been linked up. It is considered that this can only be accounted for by the falling of the river. Some 4 or 5 years ago, its width opposite the township averaged not less than 120 yards, while this is now reduced to 50 yards and the current has entirely disappeared. The fly areas in the Northern district are apparently increasing.

An outbreak of the disease on the Zomba-Blantyre Road coincided as regards the season with previously recorded outbreaks there.

Messore (L.). **Relazione della campagna antimalarica nel territorio di Marcianise nell' anno 1913.** [Report on the anti-malarial campaign in the Marcianise district in 1913.]—*La Malariologica, Naples,* viii, no. 5, 15th October 1915, pp. 119–129.

Though cases of malaria have rapidly diminished in the Marcianise district of Campania since the State distribution of quinine was begun, they still persist owing to the influx of agricultural labour from neighbouring districts and also owing to the large number of tanks in which hemp—the chief product of the region—is steeped during the summer for the preparation of the fibre. During the process the water becomes too foul for the breeding of *Anopheles,* but earlier in the season these tanks contain rain-water.

Marett (P. J.). **Fly Prevention Measures.**—*Jl. R.A.M.C., London,* xxv, no. 4, October 1915, pp. 456–460. [Received 3rd December 1915.]

The egg-clusters of *Musca domestica* deposited on manure heaps are found in sheltered spots, preferably facing the sun and in places which have been trodden on. When flies are observed ovipositing, they should not be disturbed, but the position of the eggs should be noted, so that they can be destroyed later. A trained man can remove from 30 to 40 batches a day. In summer the eggs must not be left for more than one day, since hatching takes place in from 4 to 8 hours. The first larval stage is passed in the upper 2 or 3 inches of the manure heap, the larvae remaining in groups. At the completion of the first stage, migration takes place at night and on the surface of the manure. As a trap for the larvae of this stage, square ration tins are used. These are provided with four slits about 2 inches from the bottom, are filled with about 4 inches of sand or chaff and are embedded in the manure heap so that the slits are on a level with the surface. The traps are placed along the edges of the mound at intervals of 3 or 4 feet. In one trap, 5,000 larvae have been caught in one night. A 40 per cent. solution of formalin with native raw sugar added is used against adult flies. This solution is placed on the heaps in tins, with bread soaked in it. The traps are very effective on calm, dry days.

Incineration of manure is carried out by another unit. The incinerators consist of large-meshed wire netting, placed on iron bars supported on empty cresol drums. The wire netting is covered with the drier portions of litter, and manure is heaped on this ; fires are started with old sacks soaked in paraffin, which are applied to the face exposed to the wind. When the fire is started, the incinerators are loaded to a depth of 2½ feet. The condensation of moisture is avoided by not loading to a greater height than indicated. The chief objections to this method are the amount of labour required and the materials used in making the incinerators.

In camps and billets only the adult flies can be dealt with. Wire gauze is applied to all windows ; kitchens and dining-rooms are furnished with balloon wire traps, baited with stale beer and sugar or with a paste consisting of cheese, sugar and water. Sticky papers are made by covering paper with a well-boiled mixture of 5 parts castor oil and 8 parts resin. Kitchens are sprayed at least once a week with formalin solution, 2 ozs. to 1 gal. water. Protection of foodstuffs must be carried out as thoroughly as possible.

Dible (J. H.). **Transmission of Malaria in Northern France.**—*Jl. R.A.M.C., London,* xxv, no. 5, November 1915, pp. 577–579. [Received 17th December 1915.]

Two cases of malaria were reported in Northern France during August 1915. The disease was contracted in the region occupied by the British Army, and it is logical to conclude that malaria-infected mosquitos are now present in this area. The country in which the cases occurred is well suited to mosquitos, being flat and well watered.

The farms in this district have an abundance of decaying organic material in their vicinity, and mosquitos are numerous during the summer months. Prior to the War there were presumably no malarial inhabitants in this region. It is significant that one of the patients had been living during the whole summer in a part of the country which had been occupied by Indian troops, among whom recrudescent cases of malaria were common. The occurrence of these cases raises the question of the possibility of the disease remaining endemic, and suggests the necessity for the adoption of strict anti-malarial measures in these localities.

Joyeux (C.). **Sur quelques Arthropodes récoltés en Haute-Guinée française.** [Some Arthropods collected in French Upper Guinea.] —*Bull. Soc. Path. Exot., Paris,* viii, no. 9, 10th November 1915, pp. 656–659.

The larvae of *Amblyomma variegatum* are very abundant at the beginning of the dry season, from early November to February. Both man and animals are attacked by these larvae, which begin to drop off 12 hours after attachment. The nymphs also attack man, but less frequently and only one definite case of attack by the adult was observed. *Dermanyssus gallinae* and *D. hirundinis* are common in poultry houses and in the nests of the swallow, *Hirundo rufula,* Rüpp., and the swift, *Micropus affinis,* Gray, attached to roofs. As in Europe, the bites of these mites cause irritation which disappears in a few days; they do not appear to transmit any Haematozoa. The author also bred *Cimex boueti,* for which Roubaud has since suggested the generic name *Leptocimex. Hippobosca maculata,* Leach, is common. It bites horses, cattle and sheep, but the author has never succeeded in inducing it to attack man. The whitish puparium laid by the female blackens in 24 hours, the adult emerging in from 23 to 30 days. *Glossina palpalis* and *G. morsitans* are frequently met with on the banks of the Niger and its tributaries, two examples of *G. morsitans* being taken for every 52 of *G. palpalis.* The SIMULIIDAE collected were all allied to *Simulium aureum.*

The author bred the following mosquitos: *Culiciomyia nebulosa,* Theo., *Culex duttoni,* Theo., *Anopheles* (*Pyretophorus*) *costalis,* Lw., which was very numerous, *A.* (*Myzomyia*) *funestus,* Giles, *Cyathomyia fusca,* Theo., *Stegomyia fasciata,* F. (*calopus,* Meig.), and *Toxorhynchites brevipalpis,* Theo. The larvae of the last species are very carnivorous and destroy all the usual fauna in native pots. The pupal stage lasts six days.

Only one case of human myiasis, caused by *Lucilia argyrocephala,* Wied., was noticed. Seven cases of animal myiasis due to *Pycnosoma* (*Chrysomyia*) *bezziana,* Vill. (*megacephala,* Bezzi *nec* Fabricius), were observed. This species has also been recorded in the Upper Ivory Coast by Bouet and Roubaud and in the Belgian Congo by Rovere, who worked out its life-history. The female lays from 70 to 95 eggs on the skin. In from 18 to 24 hours the larvae penetrate to the subcutaneous tissue and develop in it. The adult larvae fall to the ground and pupate there. While Rovere only observed this myiasis in cattle, the author also found it in horses. *Sarcophaga nurus* was also present; pupation in this species takes place in 14 days, the adults emerging 24 to 30 days later. The Cayor worm, *Cordylobia anthropophaga*, appears in March and then diminishes till it disappears in September. *Auchmeromyia luteola* is very common in the native huts. *Gastrophilus equi* is very common in the horse and the mule; *G. nasalis* was once observed in the duodenum of a mule.

RODHAIN (J.) & BEQUAERT (J.). **Sur quelques Oestrides du Congo.** [On some Congo Oestrids.]—*Bull. Soc. Path. Exot., Paris*, viii, no. 9, 10th November 1915, pp. 687–695.

This is a continuation of a previous communication [see this *Review*, Ser. B, iii, p. 198]. Sufficient material has been collected to enable a revision of the OESTRINAE to be undertaken, and it is stated that the synoptic table published by the authors in 1913 will require serious modification. The present paper contains an outline of the more important synonymy. A key is given to the generic characters of the larvae of the OESTRINAE, those of *Cephenomyia*, Latr., and *Pharyngomyia*, Schiner, being taken from Brauer. A similar key to the characters of the adults is also given. Adults of the genera *Pharyngomyia*, Schiner, and *Aulacephala*, Macq., are not known to the authors in nature. Brauer's genus *Pharyngobolus* is but little known as an adult and may be identical with *Aulacephala.* With regard to *Cephalopsis* (*Oestrus*) *titillator*, B. Clark (*O. maculatus*, Wied.), the description and figures given by Clark leave no doubt in the authors' minds that this is the correct name for the camel Oestrid generally known as *Cephalomyia maculata.* Though *Oestrus variolosus*, Lw., is widely distributed in Africa, the larva is not known with certainty, but King's figures show a great resemblance to that of *O. bertrandi*, one of the authors' own species, which they now regard as probably identical with *O. variolosus*, Lw. They propose to substitute the generic name *Kirkioestrus* for *Kirkia*, as this name is preoccupied; two species of this genus are known with certainty—*K. surcoufi*, Gedoelst, and *K. minutus.* There is reason for thinking that *K. surcoufi* and *K. blanchardi*, Gedoelst, are the same species, in which case the latter name must have priority.

Collectors are asked to do their best to obtain examples of the parasites of the large mammals of Central Africa, as these latter are threatened with extinction owing to the rapid development of the country, and with them, the record of their parasites will be lost. The breeding out of larvae is specially urged.

ROUBAUD (E.). **Etudes biologiques sur la Mouche Domestique. Méthode biothermique de Destruction des Oeufs dans le Tas de Fumier.** [Biological studies of the Domestic Fly. Biothermic method of destroying the eggs in manure heaps]—*C. R. Soc. Biol., Paris*, lxxviii, no. 18, 3rd December 1915, pp. 615–616.

Under the ordinary conditions existing in manure heaps, oviposition by flies takes place within the first 24 hours of the addition of each fresh lot to the heap; the development of fermentation stops oviposition. The author endeavoured to ascertain what were the substances in horse-manure which in any way determined the oviposition. The presence of fresh horse urine is not necessary;

eggs were laid with equal readiness on horse-droppings with or without urine, whether the latter were fresh or six days old and fermenting. On fresh horse-dung it took place in the first 48 hours, but never on stale dung as much as a week old, and it would appear that the attraction lies in the constituents of freshly discharged dung. In what may be called pure manure heaps, consisting only of excrement and the urine with which the litter is saturated, the house-fly will apparently not oviposit, but if some secondary element such as wheat-bran be introduced, the heaps become suitable for oviposition. A list is given of seven combinations of bran and various urines diluted or otherwise with water, and in all these mixtures oviposition took place.

A mixture of horse and cow dung allows of the development of the larvae in the latter, and if a heap of horse-manure be covered with cow-dung, the flies at once begin to oviposit on the latter; this never occurs on bovine dung alone. Experiments have shown that by raking off the top of a fermenting manure heap, and exposing the hotter layers, if fresh stable-dung and litter not more than 24 hours old be thrown into the hole and covered up with the rakings, the heat is sufficient to kill all the eggs in the fresh dung; the eggs cannot support a temperature above 115° F. In placing the fresh manure on the heap, care should be taken to rake it over so that as much as possible of the fresh dung falls to the bottom of the hole, i.e., nearest the heat; if this be done late in the day, practically all the eggs laid on that dung will be destroyed [see also this *Review*, Ser. A, iii, p. 197, 198].

STANTON (A. T.). **Notes on Sumatran Culicidae.**—*Ind. Jl. Med. Research, Calcutta*, iii, no. 2, October 1915, pp. 251–258. [Received 10th December 1915.]

Nineteen species of *Anopheles* are known from the Malay Peninsula, twelve of which also occur in Sumatra. One species only has so far been found to be peculiar to Sumatra.

The following Sumatran mosquitos are recorded:—*Anopheles aconitus*, Dön.; *A. albotaeniatus*, Theo.; *A. barbirostris*, Van der Wulp; *A. fuliginosus*, Giles; *A. kochi*, Dön.; *A. leucosphyrus*, Dön.; *A. ludlowi*, Theo.; *A. maculatus*, Theo.; *A. rossi* var. *indefinitus*, Ludlow; *A. schüffneri*, Stanton; *A. sinensis*, Wied.; *A. tessellatus*, Theo.; *A. umbrosus*, Theo.; *Mucidus laniger*, Wied.; *Armigeres jugraensis*, Leicester; *Stegomyia scutellaris*, Walk.; *S. fasciata*, F.; *Finlaya poicilia*, Theo.; *Taeniorhynchus brevicellulus*, Theo.; *T. conopas*, Frauenfeld; *Mansonioides annulipes*, Walk.; *M. uniformis*, Theo.; *M. annuliferus*, Theo.; *Culex fatigans*, Wied.; *C. bitaeniorhynchus*, Giles; *C. vishnui*, Theo.; *C. tritaeniorhynchus*, Giles; *C. halifaxii*, Theo.; *Harpagomyia genurostris*, Leicester; *Rachionotomyia caeruleocephala*, Leicester; *Chaoborus indicus*, Giles.

CHRISTOPHERS (Major S. R.). **The Pilotaxy of** ***Anopheles.***—*Ind. Jl. Med. Research, Calcutta*, iii, no. 2, October 1915, pp. 362–370, 1 plate.

This paper deals more especially with the chaetae of *Anopheles*. No attempt is made to correlate in a systematic way the hairs in

CULICIDAE with those in allied Nematocera, but there can be little doubt that many of them are essentially connected with the phylogenetic history of the CULICIDAE, both as a whole and as regards the sub-groups. A study of the pilotaxy in *Anopheles* may therefore prove useful in prosecuting phylogenetic studies of the group.

CHRISTOPHERS (Major S.R.). **The male Genitalia of** *Anopheles*.—*Ind. Jl. Med. Research, Calcutta,* iii, no. 2, October 1915, pp. 371–394, 6 plates.

This paper gives descriptions and drawings of the male genitalia of most of the Oriental species of *Anopheles.* Some general conclusions are drawn from the descriptions and the characters of the genitalia are applied to a classification of the genus. In an appendix, the male genitalia of a large number of other species are described and figured.

MITTER (J. L.). **The Occurrence of** *Stygeromyia maculosa* **at Kasauli and its Breeding Place.**—*Ind. Jl. Med. Research, Calcutta,* iii, no. 2, October 1915, pp. 395–396, 1 table.

Larvae and pupae of *Stygeromyia maculosa* were collected from manure pits at Kasauli, while searching for the breeding places of *Haematobia sanguisugens.* Twenty-nine adults of *S. maculosa* emerged, together with a large number of *Stomoxys* and flies of the genus *Musca.* A table is given showing the number of flies caught on different dates and times, on mules in the transport lines, where the breeding place of *S. maculosa* was found. The table demonstrates the comparative rarity of this species and its habit of biting at dusk.

SKRIABIN (K.). **Живая личинка лошадинаго овода въ желудѣ грача.** [A living larva of a bot-fly in the stomach of a rook.]—**«Вѣстникъ Общественной Ветеринаріи.»** [*Messenger of Public Veterinary Medicine,* xxvi, 1915, pp. 1119–1121.] (From a bibliographical note in *Revue Russe d'Entomologie, Petrograd,* xv, no. 3, 28th October 1915, pp. 437–438.)

The author found in 1908, in Turkestan, in the stomach of a rook (*Corvus frugilegus*), the living larva of an Oestrid, identified as that of *Gastrophilus inermis*; the larva was found firmly attached in the crop. The presence of this larva in a bird is considered to have been accidental. *G. inermis* was first described by Brauer in 1858 from Austria-Hungary, and the present record extends the area of its distribution considerably.

Докладъ Комиссіи врачей при Старой Городской Больницѣ въ Одессѣ по вопросу о борьбѣ со вшивостью. [Report of a Commission of Surgeons of the Old Municipal Hospital of Odessa on the question of the control of lice.]—**«Извѣстія Всероссійскаго Союза Городовъ.»** [*Bulletins of the All-Russian Union of Towns*], *Moscow,* no. 18, October, 1915, pp. 53–58.

The investigations of the Commission were directed towards *Pediculus humanus* (*vestimenti*) and *P. capitis, Pthirius pubis* being rare in the army. The observations were conducted on 51 inmates of night-shelters who had been admitted to hospital, the nature of their illness not requiring their transference to special wards. In order that the conditions should approach as closely as possible to those in the trenches, the patients did not have baths and remained in their clothes. Simultaneously with these observations, experiments were carried out *in vitro* at the Bacteriological Station and the municipal disinfecting chamber. The lice were kept in open glasses with a flat bottom, at room temperature, and balls of cotton-wool, moistened with 15 drops of ether, oils of anise, caraway, eucalyptus, cinnamon, wormwood, fennel, bergamot, lavender, petroleum or turpentine, were suspended at a distance of 4 inches from the bottom of the glass; all the insects perished after 24 hours, those in the control glasses living 3 or 4 days. Wormwood powder gave no results; insect powder from fresh Dalmatian pyrethrum stupefied the lice in 2 or 3 minutes and killed them within 24 hours. Flowers of sulphur, precipitated sulphur, calomel and a mixture of tartaric acid and sodium hyposulphite gave negative results. Small gauze bags containing camphor suspended in the glasses stupefied the lice in 2 or 3 hours and caused death after 2 days; bags containing naphthaline destroyed all the lice in 1½ hours. Experiments with the same substances on the patients showed that ethereal oils mixed in equal proportions with cotton-seed oil rubbed on the body and applied to the folds and seams of the clothes had no effect. Eucalyptus oil stupefied the parasites for an hour or two, after which they recovered; petroleum and turpentine with 50 per cent. of creoline or xylol mixed with cotton-seed oil were ineffective; slight results were obtained with sabadilla decoction, consisting of sabadilla vinegar with 10 per cent. of balsam of Peru; 15 to 20 per cent. mercury ointment combined with naphthaline was effective, but three applications of this gave rise to dermatitis. Small bags of camphor worn underneath the shirt gave slight results; those containing naphthaline proved effective, but require to be renewed every 3 days.

It was concluded that none of the substances tested can be considered completely effective under the conditions of active service, the best of them being naphthaline. Heating and boiling the clothing still remain the only really effective remedies.

,,**Походная мазь**" **для борьбы съ насѣкомыми.** ["Campaign-jelly" for the control of insect parasites of man.]— «**Садоводъ.**» [*The Horticulturist*], *Rostov-on-Don*, no. 11, November 1915, p. 854.

This jelly, which is recommended by Mr. V. S. Pirnsky against lice, etc., consists of: 15 per cent. soft soap, 10 per cent. solution of corrosive sublimate, 34 per cent. of beef fat, 34 per cent. of lard and 7 per cent. of birch tar.

Creel (R. H.). **Hydrocyanic acid gas; its practical use as a routine fumigant.**—*U.S. Public Health Reports, Washington, D.C.*, xxx, no. 49, 3rd December 1915, pp. 3537–3550, 1 fig.

Hydrocyanic acid gas is more penetrating and more toxic than sulphur dioxide or carbon monoxide. It is easily and quickly generated, requires little apparatus, is not destructive to inanimate objects and presents little danger in experienced hands. From a number of experiments, it was found that 5 oz. of potassium cyanide per 1,000 cubic feet gave as good results as 10 oz. Powdered potassium cyanide was the best, and commercial cyanide and sulphuric acid (66 Bé.) were quite as efficient as chemically pure cyanide and sulphuric acid (sp. g. 1·84). It seemed evident that holds of ships would not retain the fumes so as to be dangerous to life 30 minutes after removal of the hatches. At the rate of 5 oz. per 1,000 cubic feet the chemicals alone would cost less than the sulphur fumigation prescribed in the quarantine regulations of the United States Treasury Department. The small cost of equipment materially increases the disparity in expense.

The following apparatus is described and figured for use in holds of ships. It consists of :—(1) An ordinary wooden barrel, open at the top, as the container for water and acid solution; (2) five-gallon tins for the cyanide, with the tops removed, on pin-hinges placed on one side 2 inches below the top, and made to fit similar hinges on the sides of. (3) a funnel of galvanised iron, 23 inches in diameter at top and 6 inches at the bottom, with a depth of 12 inches, there being a series of 1-inch holes on the sides of this funnel opposite to the hinges. The acid and water mixture should be placed in the barrel before it is lowered into the hold ; the funnel is then placed in the top of the barrel and the tins containing cyanide are attached to the funnel by means of the pin hinges. Ropes are attached to the bottom of the tins and passed over the hatch coamings. By pulling these ropes, the contents of the tins are dumped into the barrel. This arrangement has proved very satisfactory.

Lamson, Jr. (G. H.). **The Poisonous Effects of the Rose Chafer upon Chickens.**—*Jl. Econ. Entom., Concord,* viii, no. 6, December 1915, pp. 547–548.

Serious losses occur each year during June and early July among chickens which have fed on *Macrodactylus subspinosus* (rose chafers). Post mortem examination shows the crop so full of the insects as to give the impression that death has been due to a "crop-bound" condition. Death has also been attributed to a mechanical injury to the crop by the spines on the legs or to the crop having been bitten by the rose chafers. Investigations carried out in Connecticut showed that death occurred in from 9 to 24 hours after feeding. An extract of rose chafers given to chickens caused high mortality. Young birds died a few hours after feeding ; older chickens, when fed with a small quantity of extract, lived, but showed signs of poisoning ; large doses resulted in their death. Adult hens did not die from the poison. From 15 to 20 individuals were sufficient to kill chickens a week old, and from 25 to 45 a chicken 3 weeks old. If death did not occur within 24 hours, the birds recovered. In less than 5 per cent. of cases convulsions occurred. Examination failed to reveal the presence of arsenic, which might have been found on the foliage upon which the rose chafers had been feeding. Extracts for intravenous injections were made from 40 grams of rose chafers and 60 cc. of salt solution of 0·9 specific gravity. Three cc. of extract injected into a rabbit weighing 690 grams caused death in 6 minutes ; 4 cc. caused the death of a

1,435 gram rabbit in $3\frac{1}{4}$ minutes. So far as can be determined, the insects contain a neuro-toxin, which has a direct effect upon the action of the heart of both chickens and rabbits and is excessively dangerous as a food for chickens. It is essential that chickens be kept in mowed fields and away from grape vines and shrubs upon which the rose chafers may be abundant.

THEILER (Sir A.). **The Problem of Horse-Sickness.**—*South African Jl. Sci., Cape Town*, xii, no. 3, October 1915, pp. 65–82. [Received 29th December 1915.]

Facts collected up to the present time tend to show that horse-sickness is transmitted by winged insects and experience has shown that the exclusion of such insects from stables prevents infection, though attempts to transmit the disease with various insects have failed. The negative results obtained are attributed to the difficulty of keeping winged insects alive in an insect-proof loose-box together with a horse for a sufficiently long time, or even in a glass cylinder when feeding them individually. In experiments undertaken to find out the source of infection of the insect host, the results were negative, but it was observed that other domestic animals are probably also susceptible to this disease. Horse-sickness occurs throughout Central and East Africa to the Red Sea. The question of immunity is discussed, as well as prevention of the disease by protecting the animals from infection.

Poison Bait for Biting Flies.—*South African Jl. Sci., Cape Town*, xii, no. 3, October 1915, p. 94. [Received 29th December 1915.]

It has been found possible to destroy *Stomoxys calcitrans* by means of a liquid poisoned bait, containing 1 per cent. of sodium arsenite and 10 per cent. of sugar. The possibility of destroying other biting flies in South Africa, such as tsetse-flies and TABANIDAE, in the same way, is suggested.

MACFIE (J. W. S.). **Observations on the Bionomics of** *Stegomyia fasciata.*—*Bull. Entom. Research, London*, vi, no. 3, December 1915, pp. 205–229, 2 tables.

In investigating the habits of *Stegomyia fasciata* only recently emerged adults were used. They were kept in glass jars with water at the bottom. A fold of paper was fixed in the middle of the jar for the insects to rest on, and on the upper surface of the paper drops of honey were placed. Human blood was supplied daily. The maximum length of life of the males was 28 days, and that of the females, 62 days. Several females showed signs of senescence after laying a number of batches of eggs. The first blood-meal taken by the female was on the second or third day after emergence from the pupa. Fertilisation and a blood-meal preceded oviposition, and fertilisation preceded the blood-meal. Eggs were laid on the sixth or seventh day. After this, they fed regularly once, soon after each batch of eggs was laid. Three or four days elapsed between each act of oviposition. Egg-laying continued throughout life, the number in each batch varying greatly.

The majority of the batches were found early in the morning between 6 and 7 a.m.; if not laid at this time, they were generally found in late afternoon or evening. An unfertilised female retained her egg-laying power for 43 days, and it has been shown by Goeldi that fertilised eggs may remain dormant in a female for 102 days, if a feed of blood is withheld. A temperature of 98·6° F. appeared to have the effect of shortening the life, diminishing the blood-sucking propensities and destroying the fertility of *S. fasciata*.

Inbreeding experiments showed that adults which hatched from eggs laid by the same mother in the same batch were fertile with each other. This fact is of little importance in the case of *S. fasciata*, as it is very abundant at Accra, but is of significance in the case of the rarer species of *Stegomyia*, for which the avoidance of inbreeding would be more difficult.

The duration of the life-cycle can be extended under certain conditions. In one case the egg-stage lasted from 14th June to 20th July. The arrest of development of the larvae in many instances may have been due to the fouling of the medium or to infection by Ciliates or *Vorticella*. Several species of mosquitos are known to breed in salt or brackish water. At Accra, *Ochlerotatus irritans* breeds in water containing 1,400 parts of chlorine per 100,000, *Culex fatigans* in water containing 1,600 parts and *C. decens* in water containing 2,000 parts (=3·28 per cent. Na Cl). Experiments showed that *S. fasciata* either would not oviposit in a 2 per cent. salt solution, or laid eggs which were rapidly killed. In several experiments with saline media, development appeared to be accelerated, as compared with controls in tap-water. This acceleration may be a natural reaction on the part of larvae and pupae to protect themselves from the drying up of pools in which they normally breed.

Lamborn (W. A.). **Second Report on *Glossina* investigations in Nyasaland.**—*Bull. Entom. Research, London*, vi, no. 3, December 1915, pp. 249–265, 3 plates.

During the latter part of March and the beginning of April, the distribution of *Glossina morsitans* on the east side of Lake Malombe was studied. Although in none of the localities visited were the flies so numerous as in the proclaimed area, yet isolated flies were found over a very wide range. The distribution of *G. morsitans* in varied types of country was well seen in the fly-belt of the proclaimed area. The numbers were greatest where the thorn bushes and large trees were thickest. In studying the proportion of the sexes, it was found that when the flies were bred from pupae, the numbers of males and females were almost equal; when flies were captured, the males were much more numerous than the females. This is due to a difference in feeding habits, and to the fact that females are more abundant on the outskirts of a fly area, and when pregnant, hide themselves from the males.

The adults were found to be attacked by a dragonfly, *Orthetrum chrysostigma*, Burm. During May, two specimens of *Mutilla glossinae* Turner, were reared from pupae near Monkey Bay. Since then, 54 males and 71 females have been reared from 1,143 pupae. There is reason to believe that *M. glossinae* can be bred in some numbers in the laboratory. The parasites do not as a rule become active until the afternoon, remaining hidden until that time beneath objects on the top of the ground, or buried beneath the surface of the soil. A Bombyliid fly, *Thyridanthrax abruptus*, Lw., parasitic on *G. morsitans* in Rhodesia, was also reared from pupae. This fly is not uncommon in the fly area. Two Chalcids, *Stomatoceras micans*, Wtrst., and an apterous species [*Eupelminus tarsatus*, Wtrst.] were bred from the pupae. About 1 per cent. of the Mutillids showed evidence of a Chalcid hyperparasite. No parasites have as yet been reared from pupae from the proclaimed area, a fact which may explain the numerical superiority of *G. morsitans* in this region.

Observations on the larva of *G. morsitans* showed that the slimy secretion which covers it when newly born, is protective against such ants as occur in breeding places and probably keeps the cuticle from being injured when the larva burrows into the soil. The condition of the soil is an important factor in determining the breeding place. In nearly every case, breeding places were found beneath a fallen and decaying tree, which had been prevented by its branches from touching the ground and which kept an area beneath it shaded and free from moisture. Few pupae were found in hard clayey soil beneath trees. Pupae may be deposited in cavities of dead trees, in which a certain amount of soil has collected. The chemical composition of the soil is immaterial, so long as it is friable, nor is the orientation of the breeding place important, provided the pupae are sheltered from the direct rays of the sun. In Nyasaland, the favourite situations are near game and native paths or near water-holes.

On his return to the proclaimed area in June, the author found an abundance of flies along the road running west from Domira Bay where clearing operations had been carried out in the previous January. This was due to the fact that many trees had fallen before being completely severed, a condition which formed an ideal breeding place for the fly.* Many pupae were found on a part of the area from which the fly had temporarily receded, on account of drought. These may repopulate the area when a change of conditions takes place.

Experiments in liberating marked flies confirmed the supposition that, in passing from a *morsitans* area to a free area, the same flies which had been hovering round continue to follow for a considerable distance. Motor cyclists coming into Fort Johnston have asserted that the flies settle on their backs and are carried into the township. The increased motor traffic may be indirectly responsible for the high mortality of cattle from trypanosomiasis which has occurred during the past few months at this place.

The sense of sight and of smell probably play a part in attracting flies to moving objects, but this statement requires further confirmation.

Glossina brevipalpis was found in February in a limited area of the Lingadzi estate, eight miles from Lake Nyasa. The fruit trees growing on the spot were bananas, mangoes and citrus trees ; three indigenous trees were present. The area was devoid of undergrowth, except for a belt of high grass growing in the mud of the river bank. A breeding ground of this species was discovered later near Lake Nyasa, where its haunts are characterised by the great density of the vegetation and a light, sandy soil. The greatest number of pupae was found in a small area traversed by a path evidently frequented by game. Four pupa cases out of 737 showed evidence of parasitism, probably by Chalcids.

---

*[This observation is of no little importance, for it serves to indicate that if clearing operations are carried out carelessly they may actually cause an increase, instead of a diminution, in the numbers of the fly. In this instance, it seems probable that the mere clearing of all undergrowth, without felling the timber, would have been both more effective and more economical.—Ed.]

TAYLOR (F. H.). **A Blood-sucking Species of *Pericoma* in Queensland (Dipt.).**—*Bull. Entom. Research, London*, vi, no. 3, December 1915, p. 267, 1 plate.

Pericoma townsvillensis, sp. n., from Townsville, Queensland, is described. This is the first species of the family PSYCHODIDAE recorded in Australia. It is a severe biter, the irritation remaining for some hours. In one case the swelling caused by the bite was surrounded by a marked reddish area; these symptoms persisted for three weeks.

KNAB (F.). **Some New Neotropical Simuliidae.**—*Bull. Entom. Research, London*, vi, no. 3, December 1915, pp. 279–282.

The species described in this paper were collected in tropical America and include the following:—*Simulium sanguineum*, sp. n., from the Atrato River, Colombia, attacking man; *S. limbatum*, sp. n., from British Guiana; *S. placidum*, sp. n., from Trinidad. The last-named species does not appear to attack man, all the specimens taken being found on the ears of horses or mules. The eggs are laid on stones at the side of streams. Larvae and pupae are found in the strongest current, attached to the sides of boulders or to dead sticks or leaves. Eggs laid in a glass tube hatched after five days.

SCHWETZ (Dr. J.). **La limite occidentale de la *Glossina morsitans* dans le Katanga du Nord.** [The western limit of *G. morsitans* in North Katanga.]—*Bull. Entom. Research, London*, vi, no. 3, December 1915, pp. 283–288, 1 map.

Climate, vegetation and the distribution of water are the three factors, a knowledge of which enables the presence or absence of a given group of *Glossina* to be foreseen in Central Africa. The terminology with regard to vegetation is often inexact and the confusion has arisen owing to the difficulty of adapting clear definitions to the endless variations present in nature. The author defines the various terms as follows: Forest, consisting of tall trees, the upper branches of which give a permanent shade and the trunks of which are entwined by a profusion of creeping plants, small trees and bushes; in the Lomami region such forests are met with along rivers and in marshy lowlands. Wood or park land comprises an area covered with more or less stunted trees which usually give little shade; few or no creeping plants are present. Savannah consists of a flat or undulating area covered with grass; if the grass is short, the term steppe is suggested. A savannah is generally dotted here and there with bushes and small trees. When these are plentiful and the trees are of a certain height, a wooded savannah results.

While all species of *Glossina* need shade, *G. morsitans* does not require to be near water, as is the case with *G. palpalis*, which further requires a moderately hot, damp temperature. *G. morsitans* is therefore to be found only in the woodland, while *G. palpalis* occurs in the forest near water. The Lomami district varies in altitude from about 1,500 feet in the north to about 3,600 feet in the south. Though forming part of the Katanga administration, Lomami is distinguished by its geological and botanical features. As regards the latter, Katanga is characterised by an almost continuous woodland, broken only by grassy plains on the very high plateaus. This woodland is only found on the south-eastern edge of the Lomami district, the remainder of which is a more or less typical savannah with areas of forest along the rivers and in the lowlands. In certain parts, areas of woodland are met with, but they are isolated and do not cover large, continuous stretches, as in Katanga.

Pending the issue of a special report, notes are given on the limits of *G. morsitans* and of the dominant type of vegetation which are made clear by the map accompanying the report. Though *G. morsitans* is plentiful between the Luvidjo river to Ankoro, there are no permanent streams, though the country is typical woodland abounding in game. During the dry season there is no water near the road for a distance of about 21 miles and yet *G. morsitans* was seen in greater abundance on this plateau than anywhere else. On the whole the limits of the woodland correspond with those of *G. morsitans* and a gradual change of the former indicates a similar one in the numbers of the latter. In conclusion it may be said that the western limit of *G. morsitans* in this part of Africa coincides with the disappearance of the woodland. The author therefore points out that M. Bequaert was in error in putting the Lualaba River as the western limit of this fly, which extends in suitable localities for 70 miles or more to the west of that river.

Schwetz (Dr. J.). **Quelques Observations Préliminaires sur les Moeurs de la *Glossina brevipalpis*.** [Preliminary Observations on the Habits of *Glossina brevipalpis*.]—*Bull. Entom. Research, London*, vi, no. 3, December 1915, pp. 289–292, 1 map.

Without a knowledge of the peculiar habits of *Glossina brevipalpis*, the existence of this fly can only be discovered by chance. It remains inactive and hidden throughout the day, except after sunrise and more especially before or after sunset. It also flies close to the ground, so that Europeans are less likely to notice its presence than the bare-legged natives. It needs shade and its requirements as regards water are mid-way between those of *G. morsitans* and *G. palpalis*. Artificial light by night causes *G. brevipalpis* to become extremely active, which is not the case with *G. palpalis*. *G. brevipalpis* is less voracious than *G. palpalis*, and among over 1,000 specimens only two or three were found with their abdomens distended with ingested blood, and only three females were taken. In the Belgian Congo, this species had been taken in South Katanga and on the west coast of Lake Tanganyika, but had not previously been recorded west of the Lualaba.

Howlett (F. M.). **A Preliminary Note on the Identification of Sand-flies.**—*Bull. Entom. Research, London,* vi, no. 3, December 1915, pp. 293–296, 1 diagram, 2 plates.

The small amount of information at present available on the life-histories of the species of *Phlebotomus* has led to the publication of the present note in the hope that it might be of use to medical officers by giving them easily-seen characters by which the early stages of *Phlebotomus papatasii*, *P. argentipes* and *P. minutus* may be differentiated. These species are common in India and the first and last are also known to occur in Southern Europe. For practical purposes, the characters of the egg and newly hatched larva are more valuable than those of the adults, since almost any engorged female will lay eggs within a couple of days and young larvae will hatch out in a week or ten days, while either the egg or the young larva affords easy means of identification. The characters of the egg and of the newly-hatched larvae are described and an account is given of the hatching of the egg. The influence of temperature is a simple bionomic character which also differentiates the species and has some practical importance. In this respect, as in others, *P. argentipes* seems to be more or less intermediate between *P. papatasii* and *P. minutus.* The length of the life-history in a typical lot of each species is indicated in a diagram. This shows that *P. minutus,* although its life-history is considerably lengthened, breeds more or less continuously through the cold weather at Pusa, Bengal, where the observations were made. Larvae of *P. argentipes* hatching at the beginning of the cold weather may develop either quickly or slowly (even in the case of larvae from the same batch of eggs); while those of *P. papatasii* hatching at the same time will remain as larvae until the following spring, when they pupate and emerge in late February or March according to the temperature.

Jordan (K.) & Rothschild (Hon. N. C.). **On some Siphonaptera collected by W. Rückbeil in East Turkestan.** — *Ectoparasites, London,* i, no. 1, 30th December 1915, pp. 1–24, 27 figs.

The fleas described in this paper were obtained in the neighbourhood of Djarkent, Semiretschenskoi, Turkestan. They include the following species :—*Coptopsylla ardua,* sp. n., from *Rhombomys opimus* ; *Ceratophyllus macrophthalmus,* sp. n., from *Arvicola terrestris scythicus* ; *C. praefectus,* sp. n., and *C. fidus,* sp. n., from *Apodemus tscherga* ; *C. elatus,* sp. n., from *A. tscherga* and *Crocidura ilensis* ; *C. tersus,* sp. n., from *Rhobomys opimus* ; *Amphipsylla dumalis,* sp. n., from *Mustela erminea, Cricetulus fulvus, Ellobius ursulus* and *A. tscherga* ; *Amphipsylla primaris,* sp. n., from *M. erminea* ; *A. contigua locuples,* subsp. n., from *Mustelus ermineus, Mustela pallida, M. nivalis, A. tscherga, Microtus obscurus, M. eversmanni, M. ilaeus* and *Crocidura ilensis* ; *Mesopsylla hebes,* sp. n., from *Arvicola terrestris scythicus* ; *M. lenis,* sp. n., from *A. tscherga* or *Allactaga elater* ; *Ctenophthalmus dux,* sp. n., from *Ellobius ursulus* and *Cricetulus fulvus.*

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.

The French Sanitary League for the Control of Noxious Insects and Animals 17
Tsetse Flies and Trypanosomiasis in Nyasaland 18
Trypanosomiasis of Stock in Nyasaland 19
Anopheles and Malaria in Italy 19
Fly Prevention Measures in Military Camps 20
The Occurrence of Malaria in Northern France 20
Blood-sucking Arthropods in French Upper-Guinea 21
Notes on some Oestrids from the Congo 22
Experiments with House-flies in Manure Heaps 22
Notes on Sumatran Mosquitos 23
The Pilotaxy of *Anopheles* 23
Notes on the Male Genitalia of *Anopheles* 24
The Habits of *Stygeromyia maculosa* in India 24
Gastrophilus inermis infesting a Rook in Turkestan 24
The Control of Clothes Lice 24
A new Preparation against Lice 25
Hydrocyanic acid gas as a Fumigant in Ships 25
The Poisonous Effects of *Macrodactylus subspinosus* upon Fowls in U.S.A. 26
The Transmission of Horse-Sickness in South Africa 27
A Poison Bait for *Stomoxys calcitrans* in South Africa 27
The Bionomics of *Stegomyia fasciata* in West Africa 27
Investigations on *Glossina* in Nyasaland 28
A Blood-sucking Species of *Pericoma* in Queensland 30
Notes on new Neotropical SIMULIIDAE 30
The Western Limit of *Glossina morsitans* in North Katanga .. 30
The Habits of *Glossina brevipalpis* in the Belgian Congo 31
The Early Stages of *Phlebotomus* in India 32
New Fleas from Turkestan 32

VOL. IV. Ser. B. Part 3.—pp. 33-52. MARCH, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., ***Chairman.***

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.
Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.
Mr. Guy A. K. Marshall.

Assistant Director.
Mr. S. A. Neave.

Assistant Editor.
Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—27, Elvaston Place, London, S.W.

Rothschild (Hon. N. C.). **Further notes on Siphonaptera fracticipita, with descriptions of new genera and species.**—*Ectoparasites, London*, i, no. 1, 30th December 1915, pp. 25–29, figs. 28–31.

Five species are added to the genus *Doratopsylla*, Jord. and Roths. These are: *D. intermedia*, Wagn., occurring in Central America, south-east Brazil and Paraguay; *D. curvata*, sp. n., from the kangaroo mouse and the shrew mouse in Iowa City and Alberta, Canada; *D. antiquorum*, Roths., from Brazil; *D. blarinae*, Fox, found at Washington, D.C.; *D. cuspis*, sp. n., from *Sorex araneus* in Hungary. The genotype, *D. dasycnemus*, Roths., occurs in the British Isles, Eastern France, Switzerland, Bohemia and Saxony.

Rothschild (Hon. N. C.). **On *Neopsylla* and some allied genera of Siphonaptera.**—*Ectoparasites, London*, i, no. 1, 30th December 1915, pp. 30–44, figs. 32–47.

The following fleas are described:—*Neopsylla inopina*, sp. n., from Alberta, Canada, found on *Spermophilus richardsoni*, *Putorius longicaudatus* and *Evotomys saturatus*; *N. faceta*, sp. n., from Massachusetts, on *Sciurus hudsonicus*; *N. testor*, sp. n., collected in a nest (? of mouse) near New York; *N. spinea*, sp. n., from Roumania, on *Spermophilus citellus* and *Putorius putorius*; *N. secura*, sp. n., from the Himalayas, on *Epimys* spp.; *N. stevensi*, sp. n., from Kalapokri, Nepal-Sikkim frontier, on *Epimys fulvescens*; *Phalacropsylla paradisea*, gen. et sp. n., from Paradise, Arizona, on *Epimys* sp., *Mus* sp., and civet cat; *Catallagia charlottensis*, Baker, from British Columbia, on *Peromyscus macrochirus*; *C. decipiens*, sp. n., from British Columbia, on *Peromyscus* sp. and *Neotoma cinera*, and from Alberta, on *Evotomys saturatus*.

Jordan (K.) & Rothschild (Hon. N. C.). **Contribution to our knowledge of American Siphonaptera.**—*Ectoparasites, London*, i, no. 1, 30th December 1915, pp. 45–60, figs. 48–64.

The American species of Siphonaptera described in this paper include *Anomiopsyllus nudatus*, Baker, from Arizona, on *Epimys* sp. and *Mephistus* sp.; *Callistopsyllus terinus*, gen. et sp. n.; *Megarthroglossus procus*, gen. et sp. n., from British Columbia, on *Spilogale* and *Peromyscus*; *M. sicamus*, sp. n., from British Columbia, on *Canis latrans*; *M. longispinus*, Baker, from Red Deer River, Rocky Mountains, Canada, on *Sciurus richardsoni baileyi* and *Mus* sp.; *M. bisetis*, sp. n., from New Mexico, on *Neotoma* sp.; *Ceratophyllus ignotus*, Baker, from Ames; *C. ignotus albertensis*, subsp. n., from Alberta, on *Geomys* sp., *Mustela* sp., and *Lynx canadensis*; *C. ignotus apachinus*, Fox, from Colorado, on *Thomomys talpoides agrestis*; *C. ignotus recula*, subsp. n., from British Columbia, on *T. talpoides*, and *Mustela* sp.; *C. ignotus franciscanus*, Roths., from San Francisco, San Mateo and Simol, California, on *Thomomys bottai*, *Putorius xanthogenys* and *Clitellus beecheyi*; *Leptopsylla adelpha*, Roths., from Arizona, on *Mus* sp.; *Atyphloceras echis*, gen. et sp. n., from Arizona, on *Mus* sp.

(C244) Wt.P12 91. 1,500. 3.16. B.& F.Ltd. Gp.11 3.

Nuttall (G. H. F.) & Robinson (L. E.). **Ticks; a Monograph of the Ixodoidea. Bibliography, ii.**—*Cambridge*, May 1915, 32 pp.

This bibliography contains the titles of 462 papers dealing with ticks and their relation to disease.

Nuttall (G. H. F.) & Warburton (C.). **Ticks; a Monograph of the Ixodoidea. Part iii.**—*Cambridge*, October 1915, pp. 349–550, figs. 308–450, plates 8–13.

This part deals with the genus *Haemaphysalis*, of which 50 species and varieties are recognised. Many species, including their immature stages, are figured for the first time. The life-history of this genus agrees in the main with that of *Ixodes*. An account of the biology of *H. cinnabarina* var. *punctata*, *H. cinnabarina*, *H. leporis-palustris*, *H. leachi*, *H. concinna* and *H. inermis* is given. Of these species, *H. cinnabarina* var. *punctata* and *H. leachi* have been proved to be carriers of pathogenic Protozoa. The former occurs commonly on sheep in Kent and is capable of transmitting British redwater, due to *Piroplasma divergens*, to cattle. The latter is found throughout Africa, where it transmits canine piroplasmosis. Among the natural enemies of these ticks which are recorded are the Chalcids, *Ixodiphagus texanus*, found in the engorged nymphs of *H. leporis-palustris*, and *I. caucurtei*, in the nymphs of *H. concinna* and *H. inermis*.

Las pulgas. [Fleas.]—*Bol. Agricultura Técnica y Económica, Madrid*, vii, no. 84, December 1915, pp. 1025–1031.

This paper reviews in a brief and popular form the present-day knowledge of fleas. The chief species of economic interest are mentioned, and in the section dealing with them in their rôle as carriers of bubonic plague it is stated that this scourge has killed seven million people in the last 18 years.

L'huile de Foie de Morue contre les Mouches chez les Chevaux. [Cod liver oil against flies on horses.]—*La Vie Agric. et Rur., Paris*, v, no. 23, 4th December 1915, p. 421.

Cod liver oil exhibits a specific toxic reaction in flies. A horse which is rubbed over with this oil is quickly freed from flies, without injurious effects, the oil acting as a repellent for from 10 to 18 hours after application.

Bishopp (F. C.). **Fleas as Pests to Man and Animals, with Suggestions for their Control.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. no. 683, 8th November 1915, 15 pp., 6 figs.

Much of the matter in this paper has been recently published [see this *Review*, Ser. B, iv, pp. 4, 5]. In the eastern part of the United States, *Ctenocephalus canis* (dog flea) is of great importance as a household pest, while in parts of the south and west, the human flea (*Pulex irritans*) is primarily responsible for house infestations. A number of instances have been recorded from the southern and west-central States in which pigs appear to be the source of heavy infestations of the human flea. The adults feed on the pigs and breeding takes place in the bedding of these animals. Fleas on cats and dogs can be killed by washing the animals in a saponified coal-tar creosote preparation. In the case of cats, the solution should be washed out of the fur with soap and warm water. Fleas on pigs may be destroyed by dipping the animals in a creosote dip, or by sprinkling them with crude petroleum while they are feeding. To avoid infestation of houses, it is important to keep all animals from beneath dwellings. It is also desirable to keep separated the different kinds of animals which are subject to attack. Among the methods for destroying fleas in houses, scattering flake naphthaline over the floor of a closed room and allowing it to remain for 24 hours, or fumigation with hydrocyanic acid gas or sulphur are recommended. When infestations are derived from fleas which breed beneath or around houses, all loose material in which breeding may take place should be removed, and crude petroleum, followed by common salt and water, used freely. The application of lime to cleaned areas apparently destroys immature fleas. In exceptional cases lawns may become infested and fleas breed among the roots of the grass. It is impracticable to apply chemicals in such situations, but breeding can be checked by cutting the grass short and so exposing the young fleas to the sun. In certain districts it has been found possible to destroy fleas in barns and pig-styes by flooding the infested areas. Breeding in poultry houses may be prevented by scattering salt on the ground two or three times a week and then watering thoroughly. The control of *Echidnophaga gallinacea* on fowls may be accomplished by applying carbolated vaseline or a mixture of kerosene and lard to the affected parts.

HASE (A.). **Weitere Beobachtungen über die Läuseplage.** [Further observations on the plague of lice.]—*Centralbl. Bakt., Parasit. u. Infektionskrankh., 1te Abt. Originale, Jena,* lxxvii, no. 2, 29th November 1915, pp. 153–163.

The author was sent by the Ministry of War at Berlin to investigate the question of lice on the eastern front. Some individuals are never infested with lice, while others develop an insensibility to bites. This latter fact explains the indifference with which the civil population of Russian Poland view the presence of these parasites. An examination of 181 of the various prophylactics advertised showed that most of them were completely useless. It may safely be said that, up to the present, no really lasting preparation has been found; the very best are only effective for a couple of days. Even better class soldiers stated that dirty, greasy underclothing conferred a certain protection against infestation and it was found that the defective ventilation—due to the clogging by grease and dirt—caused a high temperature of about 86° Fahr., and that this is a deterrent to lice. Some of the men freed their shirts by laying them on ant-hills; this method was mentioned by Gaulke in 1863. The troops were all anxious to be freed from the pests with the exception of an East Prussian, who said that the little creatures reminded him of home.

Hegh (E.). **Notice sur les Glossines ou Tsétsés.** [A short account of Tsetse-Flies.]—Published by Hutchinson and Co., London, for the Ministry of the Belgian Congo. [1915]. 148 pp., 29 figs.

This is a useful and well compiled résumé of the work already published on tsetse-flies, and is intended for the use of officials in the Belgian Congo. The study of these flies is a matter of extreme importance and the discovery of an effective means of combating them would be invaluable to that country. Following Austen's classification, the genus is divided into four sections:—(1) *Glossina palpalis* group; (2) *G. morsitans* group; (3) *G. fusca* group; and (4) *G. brevipalpis* group, and the distribution of the members of these groups is given. The method of reproduction is described, and an account given of the different stages in the life-history. The distribution of *G. morsitans* and *G. palpalis* in the Belgian Congo is given in detail. In feeding experiments with tsetse-flies it has been shown that food consisting of mammalian blood is more favourable for reproduction than that of birds. In considering the relation between tsetse-flies and wild game, it is stated that the present evidence of the habits and distribution of the flies and those of big game tends to show that the latter are not indispensable for the maintenance of the insects. In discussing the means of control of the flies, the following factors are considered:—(1) the action of external agents (heat, cold, humidity, etc.); (2) the methods of limitation and destruction (predaceous and parasitic enemies, prophylactic measures, capture of adults, etc.). The pamphlet concludes with an account of the best methods of collection, preservation and breeding of the flies.

Lutz (A.) & Machado (A.). **Viajem pelo rio S. Francisco e por alguns dos seus afluentes entre Pirapora e Joazeiro.** [A journey on the S. Francisco River and on some of its tributaries between Pirapora and Joazeiro.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, vii, no. 1, 1915, pp. 5–50, 18 plates. [Received 20th December 1915.]

This journey through the States of Bahia and Minas Geraes (Brazil) began in April, when the dry weather was already well-established, and lasted up to mid-July. With one or two exceptions, there was no rain during that period.

The following is a list of the blood-sucking Diptera collected:—Simuliidae: *Simulium amazonicum*, Goeldi, *S. brevibranchium*, sp. n., *S. diversifurcatum*, Lutz, *S. incrustatum*, Lutz, *S. orbitale*, Lutz, *S. paraguayense*, Lutz, *S. pruinosum*, Lutz, *S. rubrithorax*, Lutz, *S. spinibranchium*, Lutz, and *S. subviride*, Lutz. Ceratopogoninae: *Culicoides debilipalpis*, Lutz, *C. guttatus*, Coq., *C. paraensis*, Goeldi, *Cotocripus stylifer*, Lutz, and *C. pusillus*, Lutz. Psychodidae: *Phlebotomus intermedius*, Lutz. Tabanidae: *Diachlorus bimaculatus*, Wied., *D. immaculatus*, Wied., *Chrysops laetus*, F., *C. molestus*, Wied., *Erephopsis pubescens*, Lutz, *E. pygmaea*, sp. n., *E. scionoides*, sp. n., *E. xanthopogon*, Wied., *Selasoma tibiale*, F., *Cryptotylus unicolor*, Wied., *Tabanus miles*, Wied., *Neotabanus comitans*, Wied., *N. ochrophilus*, Lutz, and *N. triangulum*, Wied. The mosquito fauna observed during the journey was poor compared with that in the neighbourhood of

Rio de Janeiro, chiefly because the species which breed exclusively in Bromeliaceae and bamboos were not present. The absence of many other species may be accounted for by the limitations due to the character of the journey, the comparatively small number of permanent lakes, the high temperature of the water due to continued sunshine and the prolonged dry weather. The larvae met with were identified as belonging to the genera *Cellia*, *Mansonia*, *Culex*, *Melanoconion*, *Uranotaenia* and *Aedes*. The larvae of *Aedomyia squamipennis*, Arrib., were easily distinguishable by having a large air-bag on either side at the base of the antenna; *Anopheles* (*Cellia*) *argyrotarsis*, R.D., occurred throughout the journey, sometimes invading the steamboat when in harbour. *A. albimanus*, Wied., is comparatively rare. *Taeniorhynchus* (*Mansonia*) *titillans*, Walk., occurred in some lakes, but this species is not common. *Uranotaenia pulcherrima*, Arrib.. was abundant, but *U. geometrica*, Theo., was rare. The last two species seldom attack man, but do not lack mandibles, as is the case with *Culex cingulatus*, Theo. (nec F.), and *A. squamipennis*. *Culex fatigans*, Wied., and *Stegomyia fasciata*, F., were abundant on board, where they bred in water in the ship's hold. Blood-sucking Hemiptera included *Cimex lectularius*, *Triatoma megista*, Burm., *T. maculata*, Erichs., and *T. infestans*, Klug, while an example of *T. rubrofasciata* was taken in the city of Bahia.

LUTZ (A.). **Tabanidas do Brazil e de alguns Estados visinhos: Segunda Memoria.** [Tabanids of Brazil and of some neighbouring States: Second Memoir.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, vii, no. 1, 1915, pp. 51–119, 3 plates.

This paper is a continuation of former ones on the systematics of the TABANIDAE of Brazil [see this *Review*, Ser. B, iii, p. 194]. The genera, *Acanthocera*, *Dichelacera* and *Stibasoma* are here dealt with in detail. Keys to the species are given, many being described as new.

TORRES (M.). **Alguns fatos que interessam á epidemiolojia da molestia de Chagas.** [Some facts relating to the epidemiology of Chagas' disease.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, vii, no. 1, 1915, pp. 120–138.

These observations were made in Brazil in that part of the State of Minas Geraes which lies on both sides of the Rio das Velhas, a tributary of the S. Francisco River. In this large area the clay-walled, palm-thatched cottages of the inhabitants are found everywhere. *Triatoma megista* and *T. sordida* abound in them, especially the first named, of which few individuals were free from flagellates, while *T. sordida*, on the contrary, rarely carried them. As regards these two species in this region, the absence of natural infection was very evident, all the flagellates observed in their alimentary canals being stages of *Trypanosoma cruzi*, morphologically identical with the parasites obtained in infections in the laboratory. *Triatoma sordida* was never found parasitised under natural conditions in the open. The age of the insect was found to have a bearing on infection. In cottages where all the adult bugs were infected, some of the nymphs were free, while infection was rare in larvae undergoing the last moults, becoming very rare or completely absent in young larvae. Observations made on young larvae taken in the cottages showed that, in nature, they suck blood from a very early stage; cannibalism, such as was observed in the laboratory in the case of *Triatoma sordida*, seems to be exceptional in nature. These facts offer a simple explanation of the seasonal appearance of the acute infections of the disease. As Chagas noted early in the study of this disease, newly-born children presenting signs of recent infection by *Trypanosoma cruzi* are more common in the hot months of the year; the acute cases first appear in September, are relatively very abundant in December and January, and are either very scarce or altogether absent in the cold months beginning in May. The species of *Triatoma* attain their final stages in the hot months, the individuals then met with in the cottages being nearly all nymphs or adults. No significance attaches to the fact that the cycle of *Trypanosoma cruzi* does not depend on the stages of the insect, careful experiments having shown that even when undergoing the first and second larval moults, *Triatoma* can infect a vertebrate by its bite. The means by which *Triatoma* becomes infected indicates the most important phase in the developmental cycle of *Trypanosoma cruzi*. The infection of the *Triatoma* larvae by contact with the faeces of infected Hemiptera must be absolutely excluded. The coprophagism noted by Brumpt in the case of *Rhodnius prolixus*, does not occur in *Triatoma megista* or *T. sordida*. Experiments also showed that in nature cannibalism only occurs between young larvae of the same age. It was established that *Triatoma* spp. are only infected by sucking infected vertebrates and that man and cats are the chief reservoirs in the cottages. Details are given of an experiment showing that of ten vertebrates, including five men and women, two cats and three dogs—three only, a man, a woman and a cat, were capable of infecting the insects after a single meal; the man infected 40 per cent. of the *Triatoma* fed on him once only, the woman 14 per cent., and the cat not less than 66 per cent. One woman, though presenting all the clinical characters of the disease, was incapable of infecting *Triatoma*. According to Machado practically all the *Triatoma* in one cottage might contain flagellates, while in another cottage they might be free, although the inhabitants might present the same symptoms of the disease. This anomaly is now explicable if it is recollected that vertebrates constitute the sole reservoir of the virus. Assuming that in a cottage containing *Triatoma* harbouring flagellates and vertebrates harbouring *T. cruzi*, the vertebrates may temporarily lose their power to infect, then the *Triatoma* will become absolutely free from flagellate parasites at the end of approximately 386 days, which is the duration of their life. In some benign forms of the disease, such as that in which affection of the thyroid gland is the most marked symptom, the capacity for infecting *Triatoma* must be very much reduced and the rôle of reservoir quite unimportant.

Chagas recorded that *Triatoma geniculata*, Latr., living in the burrows of armadillos, contained flagellates of *Trypanosoma cruzi*. It has been found that not only *Tatus novemcinctus*, L., but also *Dasypus sexcinctus* and *D. unicinctus*, L., harbour *Trypanosoma cruzi*, and in parts of the South American continent where the disease has never been reported in man and even in uninhabited districts, infected armadillos have been observed. These animals appear therefore to be the reservoir of the virus away from human habitations. A bibliography of 24 works concludes this paper.

da Costa Lima (A.). **O chalcidideo *Hunterellus hookeri*, Howard, parasita do carrapato *Rhipicephalus sanguineus*, Latreille, observado no Rio de Janeiro.** [The Chalcid, *Hunterellus hookeri*, Howard, a parasite of the tick *Rhipicephalus sanguineus*, Latreille, observed in Rio de Janeiro.]—*Rev. Vet. Zootechnia, Rio de Janeiro*, v, no. 4, August 1915, pp. 201–203, 1 plate. [Received 21st December 1915.]

In April 1914, the author observed on a dog infested with *Rhipicephalus sanguineus*, Latr., a number of small black Hymenoptera which were running rapidly about the animal's coat, and the Chalcid, *Hunterellus hookeri*, How., was bred from the ticks taken from it. A bibliography of four works is given.

Macfarlane (H.). **Report on work other than routine work done in the Bacteriological Institute, Hongkong, for the first half of 1915.** —*Hongkong*, 12th November 1915. [Received from the Colonial Office 3rd January 1916.]

The investigation of the mosquitos of Hongkong was continued. Up to date, probably not less than 50,000 specimens of mosquitos have been examined. In July visits were made to Kowloon to determine the breeding places of *Stegomyia fasciata*. Twenty-nine per cent. of the houses visited had larvae in their water storage; all the larvae bred out were those of *S. fasciata*, except one *S. scutellaris*. Most of the larvae were found in water stored in earthenware jars. The author is of the opinion that *S. fasciata* is present in Kowloon in sufficient numbers to be a serious problem in the event of yellow fever being introduced. In Victoria, the examination of miscellaneous water-holding receptacles showed that they were not to be regarded as breeding places of *S. fasciata*, though they were largely infested with *S. scutellaris*. The supply of drinking water is continuous for about seven months in the year, and search for larvae in storage vessels during the period of intermittent supply yielded 59 larvae from 1,100 vessels. These were mainly *S. scutellaris*, with a few *Culex fatigans*, no examples of *S. fasciata* being present. Results so far show that Victoria is not, for all practical purposes, infested with *S. fasciata*. The difference between the system of water supply of this town and that of Kowloon is considered responsible for this state of affairs.

Roubaud (E.). **Description de deux Simulies nouvelles des hautes régions de l'Afrique tropicale (Dipt., Tipul.).** [A description of two new species of *Simulium* from the high regions of tropical Africa. (Dipt. Tipul.)]—*Bull. Soc. Entom. France, Paris*, no. 18, 24th November 1915, pp. 293–295, 2 figs. [Received 3rd January 1916.]

A description is given of *Simulium neavei*, sp. n., from altitudes of from 4,000 to 5,000 feet in W. Ankole, Uganda, and *S. dentulosum*, sp. n., taken at 6,000 to 7,000 feet on the slopes of Mt. Kenya and at 3,600 feet at the foot of Mount Elgon, British East Africa.

D'ANFREVILLE (L.). **La Fièvre jaune et le Maroc.** [Yellow fever and Morocco.]—*Bull. Soc. Path. Exot., Paris,* viii, no. 10, 8th December 1915, pp. 732–733.

The introduction of yellow fever into Morocco is likely to be greatly facilitated by the completion of the harbour works at present in course of construction. *Stegomyia fasciata*, the transmitter of yellow fever, is distributed northward as far as the frontiers of France, occurring throughout Spain, and in the coastal districts of Morocco has been taken in Mazagan in the south and at Rabat and Salé towards the north. This mosquito begins to appear in May, and disappears at the end of November. It is especially abundant from July to September, and the houses of the Arabs form favourable places for breeding. An epidemic of yellow fever has been prevented by the absence of good sea-ports. Steamers anchor at a considerable distance from the shore, and infected mosquitos, even in a favourable wind, would scarcely be able to reach the land. The only possible means of contamination would be the landing of a yellow fever patient during the first three days of infection. The dangerous season is the same for Morocco as for West Africa, the ports of Senegal, where the disease is well known, being only three or four days distant. It is therefore of the utmost importance for the future protection of Morocco that strict sanitary measures should be enforced at the ports.

RODHAIN (J.) BEQUAERT (J.). **Sur quelques Oestrides du Congo (3me communication préliminaire).** [On some Oestrids from the Congo.]—*Bull. Soc. Path. Exot., Paris,* viii, no. 10, 8th December 1915, pp. 765–778.

This paper deals with the Oestrid parasites of *Elephas africanus*, Blum., in the Belgian Congo. Four out of the five known species parasitic on elephants occur in this region. These are: *Neocuterebra squamosa*, Grünberg, *Pharyngobolus africanus*, Brauer, *Cobboldia loxodontis*, Brauer, and *C. chrysidiformis*, sp. n.; the fifth species is *C. elephantis*, Cobb, occurring in the Indian elephant.

The larvae of *N. squamosa* are found in the adipose tissue of the sole of the foot. The numbers obtained were few, and attempts to rear the adult failed. The larvae of *P. africanus* occur commonly, attached to the wall of the oesophagus, in elephants found in the Welle region. The pupae have been obtained from fresh dung. *C. loxodontis* and *C. chrysidiformis* are very frequently met with side by side in the stomach of the same animal. A description of the two species is given. The duration of the nymphal stage in both is 19 or 20 days.

WEIDMAN (F. D.). **An Arachnoid (*Pneumotuber macaci*, Landois and Hoepke?) parasitic in the lungs of a Monkey (*Macacus rhesus*).**—*Jl. Comp. Path. Therapeut., London,* xxviii, no. 4, December 1915, pp. 326–330, 1 fig.

An Arachnoid parasite, *Pneumotuber macaci*, Landois and Hoepke, was found in nodules in the lungs of a monkey from the Philadelphia Zoological Gardens. Other records of similar parasites have been made in the cases of an ape, *Cynocephalus* sp., from Java, eleven examples of *Cercopithecus schmidti*, from the Upper Congo region, and *Otospermophilus beecheyi* (Californian ground squirrel). The degree of pathogenicity of the parasite is problematical. It is probably not sufficient to cause death. The mode of entry is not known, but it is presumed that ova or larvae are inhaled, develop in a bronchus, and thence penetrate into the lung parenchyma. It is possible that the natural habitat is upon straw used for bedding, or upon fruit. According to Landois and Hoepke, the ova are swallowed with food; the larvae develop in the intestine, then penetrate the intestinal walls into lymphatic spaces, eventually reaching the lungs through the thoracic duct and blood stream. This route seems unlikely.

Among birds, the best known Arachnoid infestation is that of hens by *Cytodites nudus*. The parasite occupies the air spaces and bronchi, causing a fatal disease. A few cases have been recorded among human beings, though the parasites have not been found in the lungs. The source of infestation in man is unknown.

Jepson (F. P.). **Report of the Entomologist.**—*Dept. Agric., Fiji, Ann. Rept. for the year 1914, Suva*, 6th May 1915, pp. 17–27. [Received 7th January 1916.]

Stegomyia fasciata, the chief carrier of yellow fever, is abundant in Fiji, and in view of the opening of the Panama Canal is of primary importance. The question of the formation of a mosquito bureau at Suva is under consideration. The following are the species of mosquitos recorded in Fiji:—*Culex fatigans*, *C. nocturnus*, *C. jepsoni*, *Stegomyia fasciata*, *S. pseudoscutellaris*, *Finlaya poicilia*, *Phoniomyia* sp., and *Taeniorhynchus brevicellulus*.

A notable diminution in the numbers of *Musca domestica* (house-fly) occurred in the province of Bua. The decrease was attributed by some to improved sanitation, by others to the work of the wasp, *Polistes hebraeus*, which is predaceous on the adults and larvae. The latter theory is the more probable, as certain social wasps are known to feed their larvae on flies. According to Illingworth, house-flies in Fiji are controlled by a small brown ant. Large numbers of *Stomoxys* sp. were found in one paddock, breeding in horse manure. These could be checked by dressings of lime.

Ferguson (E. W.). **Descriptions of new Australian Blood-sucking Flies belonging to the Family Leptidae.**—*Jl. and Proc. R. Soc. New South Wales, Sydney*, xlix, no. 2, 15th November 1915, pp. 233–243, 1 plate.

The species described in this paper were taken between March and June in various localities in New South Wales. With the exception of *Spaniopsis clelandi*, which occurs on the mountains in summer, all the others are autumn or winter forms. They are all found on the sandstone ridges, and not in the gullies, and probably have a wide distribution along the coastal districts of eastern Australia, but so far have not been found west of the mountains. It has been suggested that the flies may have a causal connection with "bung eye," but in the opinion of the author this is unlikely, since this disease is more prevalent in the inland parts than on the coast and is practically confined to the summer months. The following species are described :—*Spaniopsis vexans*, sp. n. ; *S. marginipennis*, sp. n. ; *S. clelandi*, sp. n. ; *S. longicornis*, sp. n.

MACFIE (J. W. S.). **Babesiasis and Trypanosomiasis at Accra, Gold Coast, West Africa.**—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 4, 30th December 1915, pp. 457–494, 2 plates, 10 tables, 6 charts.

Cases of babesiasis among cattle and sheep have been recorded from Nigeria, the Ivory Coast and the Congo. Examination of the blood of domestic animals at Accra showed that piroplasms occurred in 53 per cent. of the hump-backed cattle, in 40 per cent. of the straight-backed cattle, and in 21 per cent. of the sheep. None were found in pigs and goats. Two species of *Piroplasma* were met with, but owing to lack of unquestionably uninfected animals, it was not possible to determine the ticks which transmit these parasites. Presumably they are transmitted by one or more of the species collected, viz., *Margaropus* (*Boophilus*), *Ambylomma variegatum* and *Hyalomma aegyptium*. One case of canine babesiasis was found at Accra. Dogs commonly become infested with ticks, and it is therefore possible that the disease is prevalent. Twenty per cent. of the brown rats examined showed the presence of a piroplasm, *Nuttallia decumani*, sp. n., in the blood. Three types of trypanosomes are found in Accra, viz., *T. pecaudi*, *T. vivax* and *T. pecorum*. Tsetse-flies are very rare in Accra, but are numerous in the surrounding districts, and any animals coming from a distance must be exposed to attack by these insects for the greater part of their journey. It is therefore probable that the trypanosome infections recorded were contracted before reaching Accra. Trypanosomes were found in 92 per cent. of the hump-backed cattle, in 18 per cent. of the straight-backed cattle, and were rare in sheep, pigs and goats. The heavy infection of the hump-backed cattle was doubtless due to a long journey through infected districts. *T. pecaudi* (*T. brucei* of Uganda), the rarest of the three species occurring at Accra, is most fatal to domestic animals in Nigeria and probably in the Gold Coast also. In its behaviour in the tsetse-fly *T. pecaudi* is said to differ from other polymorphic trypanosomes, development taking place in the gut and proboscis, instead of in the gut and salivary glands. This parasite proved pathogenic to a white rat and to guinea-pigs into which blood from the rat was injected. *T. vivax* was present in enormous numbers in the blood of cattle examined. It was inoculated, without result, into white rats, guinea-pigs, and a rabbit. Infections by *T. pecorum* were never heavy. One case of canine trypanosomiasis, due to *T. pecorum*, occurred. Nineteen cases of equine trypanosomiasis were met with, and in all these it was almost certain that infection had taken place in Accra, either by stray tsetse-flies or by some other biting insect such as *Stomoxys* or *Lyperosia*. The immunity of mules imported from the Canary Islands is only a partial one and does not protect them from fatal infection by *T. pecaudi*. This species is invariably fatal to horses, *T. vivax* being rarely so, while *T. pecorum* is intermediate in this respect. Trypanosomiasis in Accra should be an easily preventible disease, since tsetse-flies do not appear to breed in the immediate vicinity of the town. No precautions, however, are taken to prevent the spread of the disease and infected animals are allowed to move freely about the town. Two cases of trypanosomiasis resembling acute dourine were observed in mules. The trypanosome may have been the Runcorn Laboratory strain of *T. equiperdum*, but in these cases the disease was not contracted during coitus. It is therefore possible that dourine may be transmitted by biting insects as well as mechanically in coitus.

SCHWETZ (J.). **Preliminary Note on the general Distribution of** *Glossina palpalis*, **Rob. Desv., in the District of Lomami, Belgian Congo.**—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 4, 30th December 1915, pp. 513–526, 1 map.

The district of Lomami has a tropical climate, with two seasons more or less marked according to the latitude. The altitude varies from 1,000 to 5,000 metres. In the S.E. border the "park" or bush type of vegetation is found; the remainder is occupied by savannah, traversed by belts of equatorial forest. *Glossina palpalis* in this district occurs mainly in the vicinity of water covered or surrounded by dense vegetation, and it does not occur in the neighbourhood of water when the latter is bordered only with grass, reeds or papyrus. In the Lomami district exceptions to this general principle are however found, being adaptations to local conditions. Several examinations of a given spot are necessary before it can be definitely asserted whether this fly is present or not. The statement that *G. palpalis* is active from sunrise to sunset is incorrect. Other conditions being equal, *G. palpalis* appears earlier and disappears later in the rainy season than in the dry season. It is scarcely affected by fine, warm rain, but its appearance is retarded by heavy rain. On the fords of the Lukashi and the Lurimbi, both of which routes are much traversed, the view of Roubaud that *G. palpalis* is especially abundant at river-crossings which are frequented by animals and men does not appear to hold.

FANTHAM (H. B.) & PORTER (A.). **Some experimental Researches on induced Herpetomoniasis in Birds.**—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 4, 30th December 1915, pp. 543–558, 1 plate.

The following general conclusions are reached as the result of a series of experiments on the introduction of insect flagellates into vertebrates:—Under suitable conditions insect flagellates can be introduced into vertebrate hosts and can produce infection therein. Infection, especially in birds and mammals, may result in the death of the host. Similar infections are known to occur naturally in mice and pigeons. The organisms thus introduced retain their powers of development on the same lines as when present in insects. The morphological cycle of *Leishmania* is similar to that of *Herpetomonas*. Various vertebrates may serve as reservoirs of leishmaniases. The virus may be very attenuated and so escape detection, or may be revealed by the presence of flagellate forms in cultures. It has also been suggested by Stephens that each case of leishmaniasis in vertebrates arises *de novo* from the introduction of insect flagellates.

Herpetomoniasis can be induced in birds by feeding them on insects containing Herpetomonads. *H. culicis* from *Culex pipiens* and *H. jaculum* from *Nepa cinerea* fatally infected birds which were fed on them. The disease induced may run an acute or a chronic course. In acute cases the flagellate form of the parasite was the more obvious at death ; in chronic cases non-flagellate forms were more numerous. Natural herpetomoniasis of a pigeon has been recorded in Algeria. The flagellate stage of *Leishmania donovani* in vertebrates is now known, thus completing the evidence that a *Leishmania* is morphologically a *Herpetomonas*.

Lloyd (Ll.). **On the Association of Warthog and the Nkufu Tick** (*Ornithodorus moubata*).—*Ann. Trop. Med. Parasit., Liverpool*, ix, no. 4, 30th December 1915, pp. 559–560.

Observations on *O. moubata* were made during searches for the pupae of *G. morsitans* near Hargreaves, Luangwa Valley, N. Rhodesia. A native who had been sent into a warthog burrow to obtain loose soil for examination, was attacked by ticks, with which the burrow was infested. The ticks were in various larval stages. This tick has been suggested as a possible carrier of *Trypanosoma rhodesiense*. The burrow in which the ticks were found was separated by a river from a deserted rubber plantation, and the nearest village, from which this tick was said to be absent, was four miles distant. At Mwenga, N. Rhodesia, a specimen of *O. moubata* was removed from a warthog. The animal is possibly of importance as a distributing agent of the tick and should not be overlooked in prophylactic measures against relapsing fever.

Wood (J. Y.). **Malaria in Koinadugu District, with special Reference to Kaballa, the District Headquarters, 1914.**—*Ann. Rept. Medical Dept., Sierra Leone, for the year ending 31st December 1914, London*, 1915, pp. 37–41. [Received 12th January 1916.]

Malaria is common in the Koinadugu District, the subtertian type being generally met with. The commonest carriers were *Anopheles costalis* and *A. funestus*, and possibly also *A. rhodesiensis*. Examination of three swamps in the Kaballa valley showed that breeding in these situations was not extensive, but was confined to certain portions, which may be due to the presence of certain fish, of which a species of *Barbus* was the most active in destroying larvae. Another fish, *Fundulus gardneri*, was observed to feed on eggs, larvae and pupae of *Culex*.

Entomological Reports.—*Ann. Rept. Medical Dept., Sierra Leone, for the year ending 31st December 1914, London*, 1915, pp. 51–53. [Received 12th January 1916.]

An investigation was made during the rains of the mosquitos and their breeding places to be found at Hill Station. The following were collected :—(*a*) In rock pools : *Anopheles costalis*, Lw., *Stegomyia sugens*, Wied. ; *Ochlerotatus apicoannulatus*, Edw. ; *O. minutus*, Theo. (*b*) In hollows in trees : *Culex decens*, Theo. ; *O. simulans*, Cart. ; *O. apicoannulatus*, Edw. ; *Stegomyia* sp. ; *S. fasciata*, F. (*c*) In iron pipes and tins : *S. fasciata* ; *C. decens*.

The blood-sucking Diptera collected at Bonthe and in the Koinadagu district included :—CULICIDAE : *Anopheles costalis*, Lw., *Culex consimilis*, Newst., *Ochlerotatus nigricephalus*, Theo., *Culiciomyia nebulosa*, Theo., *Stegomyia apicoargentea*, Theo., *Stegomyia fasciata*, F., *Mansonioides uniformis*, Theo., *Anopheles rhodesiensis*, Theo., *A. umbrosus*, Theo., *A. funestus*, Giles, *Stegomyia sugens*, Wied., *S. africana*, Theo., *Ochlerotatus minutus*, Theo., and *Uranotaenia nigripes*, Theo. TABANIDAE : *Tabanus socialis*, Walk., *T. pluto*, Walk., *T. taeniola*, P. de B., *T. fasciatus*, F., *T. par*, Walk., *T. besti*, Surc., *T. marmorosus*, Surc., *T. kingsleyi*, Ric., *T. congoiensis*, Ric., *T. laverani*, Surc., *T. ruficrus*, P. de B., *T. subangustus*, Ric., *T. sticticollis*, Surc., *Haematopota bullatifrons*, Aust., *H. similis*, Ric., *H. torquens*, Aust., *Hippocentrum murphyi*, Aust., *H. trimaculatum*, Newst., and *Haematopota lacessens*, Aust. MUSCIDAE : *Glossina palpalis*, R. D., *G. fusca*, Walk., *G. longipalpis*, Wied., *Stomoxys calcitrans*, L., and *S. nigra*, Macq.

The ticks collected included :—*Rhipicephalus sanguineus*, *R. lunulatus*, *R. falcatus*, *Haemaphysalis leachi*, *Margaropus* (*Boophilus*) *australis*, *Aponomma laeve*, *Amblyomma splendidum*, *A. variegatum* and *A. marmoreum*.

KENNAN (R. H.). **Report of the Senior Sanitary Officer.**—*Ann. Rept. Medical Dept., Sierra Leone, for the year ending 31st December 1914, London*, 1915, pp. 83–112, 4 plates. [Received 12th January 1916.]

Inspections for determining mosquito indices in Freetown were made quarterly, with the following results :—(1) 16th to 19th March, 0·4 per cent. ; (2) 2nd to 6th June, 11·6 per cent. ; (3) 9th to 17th September, 25·2 per cent. ; (4) 11th to 30th December, 3·2 per cent. In the September examination, 54 out of 63 breeding-places were in water-bearing plants and the mosquitos breed from the larvae included :—*Culex tigripes*, *Eretmopodites inornata*, *E. quinquevitattus*, *Stegomyia simpsoni*, and *S. fasciata*.

The presence of *Stegomyia* in vessels other than ocean-going steamers at Freetown was investigated. In thirteen vessels lying on shore, not in actual use and containing fresh water, were found the larvae of *Stegomyia fasciata*, *S. sugens*, *Culex duttoni*, and *C. pipiens*. *C. pipiens* and *S. sugens* were also bred from fresh water in lighters in the harbour. Six examples of *Anopheles* (*Pyretophorus*) *costalis* were found on a wreck a mile from the shore.

Examination of the natural breeding places of mosquitos in Freetown demonstrated the presence of :—*Culex decens*, *C. duttoni*, *C. tigripes*, *Stegomyia fasciata* and *Anopheles costalis*. In artificial breeding places *C. decens*, *S. fasciata*, *Culiciomyia nebulosa* and *A. costalis* were found.

BUCHANAN (R. M.). **Insects in Relation to Disease.**—*Glasgow Med. Jl., Glasgow*, lxxxv, January 1916, pp. 1–24, 5 plates.

This is a popular lecture delivered at the opening of the Forty-first Congress of the Incorporated Sanitary Association of Scotland, 1st September 1915. *Musca domestica* is given most attention, and other insects mentioned include *Fannia canicularis*, *F. scalaris*, *Stomoxys calcitrans, Calliphora erythrocephala, C. vomitoria, Lucilia caesar, Pollenia rudis, Scatophaga stercoraria, Glossina morsitans* and *G. palpalis.* Emphasis is laid on the fact that an intimate and complete knowledge of the life-history of noxious insects is essential if they are to be controlled.

WHITFIELD (A.). **Acarus from a Case of Copra Itch.**—*Proc. Roy. Soc. Med., London* (Dermat. Sect.), viii, no. 6, April 1915, p. 116.

In connection with a case of copra itch in a stevedore in London, the author obtained a specimen of *Tyroglyphus longior*, Gerv., var *castellanii*, Hirst, from a sample of the copra [see this *Review*, Ser. B, i, pp. 15–16].

BEVAN (Ll. E. W.). **Ticks and the Animal Diseases.**—*Rhodesia Agric. Jl., Salisbury*, xii, no. 6, December 1915, pp. 766–784, 2 figs.

Parasites introduced into domestic animals by means of ticks produce their ill-effects in several ways :—(1) by interference with the circulation of the blood ; (2) by the destruction of blood cells ; (3) by robbing the host of food material ; and (4) by the production of substances toxic to the host. Almost all cattle in Rhodesia become infected by the blue tick [*Margaropus decoloratus*] with the parasites of redwater and gall-sickness. If cattle are infected when young, they usually become more or less immune, but always retain the parasites in the blood. Older animals or imported cattle suffer more severely when infected, and in a state of lowered vitality are attacked by minor ailments such as scour, pneumonia and liver disease. The following formula is given for a dipping fluid for use against the brown tick [*Rhipicephalus appendiculatus*] :—3 lb. soft soap, 1 lb. paraffin, 4 lb. sodium arsenite (80 per cent. arsenic) and 400 gals. water. In severe cases, in addition to regular dipping, a special dressing made of from 6 to 8 paraffin wax candles dissolved in a quart of paraffin should be applied to the inside of the ears and other protected parts. In the Beira districts, diseases of cattle caused by tsetse-flies are reported to have been controlled by use of a dipping fluid.

HOLBOROW (A. G.). **Notes relating to Arsenical Dipping Fluids.**—*Rhodesia Agric. Jl., Salisbury,* xii, no. 6, December 1915, pp. 785–788.

The oxidation of arsenite of soda in dipping fluids is due to the action of micro-organisms, the arsenate produced possessing about half the tick-killing power of the original solution. Oxidation was found to be slightly arrested by the constant dipping of cattle. In three tanks near Salisbury, oxidation was shown to proceed rapidly until from 15 to 20 per cent. of the arsenite had been changed. The process was then reversed, until finally only a small quantity of arsenate was present. About 500 head of cattle were dipped in the tanks every week. There appears to be no fixed rate of oxidation which can be applied to all dipping fluids. An isometer can be used to determine the arsenite present, but leaves the arsenate unrecorded. In a Rhodesian tank, under average conditions, the fluid should be changed about every six months.

Wölfel (K.). **Beitrag zur Kenntnis der Tsetse** (*Glossina morsitans*) **und der Trypanosomiasis.** [A contribution to the knowledge of Tsetse (*Glossina morsitans*) and trypanosomiasis.]—*Zeitschr. f. Infektionskrankh., parasitäre Krankh. u. Hyg. der Haustiere, Berlin*, xvii, no. 1–2, 17th August 1915, pp. 19–36, 1 map. [Received 21st January 1916.]

In German East Africa trypanosomiasis is the most important disease of cattle next to rinderpest and coast fever. The chief areas, which are shown on a map, are an eastern belt and a western belt, both running from north to south. The eastern one follows the coast, becoming wider and denser towards the south. The western belt reaches—with some breaks—from Lake Victoria to Lake Nyasa, and touches Lake Tanganyika over a considerable distance. Between these belts lie the important cattle breeding districts, viz. :—Arusha-Moshi, parts of Muanza and Tabora, Kondoa-Irangi, Dodoma, Iringa and Langenburg, and to the west of the western belt the still more important areas of Urundi and Ruanda.

The Tabora district is one of the worst infested and most of the observations recorded here were made there. This area is mostly covered with woods or bush, with spaces of steppe and cultivated ground. *G. morsitans* is present throughout the north-western, western, southern and eastern parts of the district or nearly three-quarters of its area. The only places free from fly are the open steppes and the larger settlements. In the north-east of the district the infested bush merges into bush free from fly, although there is no change of vegetation or soil conditions. It is very probable, however, that infestation will spread into these free areas. Only on two occasions did the author come across places well stocked with game but poor in fly, and only once was fly abundant in a valley poor in game ; in the latter case, the tracks showed that game had abounded there shortly before the place was examined. In the Tabora district in dry years the fly was least abundant at the end of the dry season or at the beginning of the rainy one. The numbers increased at the end of the rainy season and reached their maximum at the beginning of the dry season.

Experiments in clearing the bush along the roads have given the following results : In rainy weather the fly, when present in moderate numbers in the bush, may be reduced, especially in the morning, by clearing. Where present in abundance, a clearing of 110 yards on either side was not quite sufficient to free the road entirely. In the dry season the fly, when abundant, was reduced on the road, but not to any great extent. Even a clearing of 330 yards on either side of the road was not sufficient to keep it away when very abundant. Clearing is therefore only of value under certain conditions, as, for instance, on roads running through infested river valleys, which are otherwise free from fly. This is the case in the neighbourhood of Kilimandjaro. Where railway stations have to be built in infested places, a clearing of 440 to 550 yards on either side will be effective.

G. morsitans does not live permanently at high altitudes, the limit lying between 4,200 and 4,600 feet. In hot weather it may be temporarily found above this limit.

Of 642 flies examined, 3 per cent. contained trypanosomes. Among 46 antelopes of eleven species, only three were found to harbour trypanosomes, which were also found in one out of thirteen wart-hogs. Nagana was common among domestic animals, and trypanosomes were found in pigs which had passed through the fly belt between Tabora and Kilimatinde. Spontaneous cures were not uncommon in the case of native donkeys and cattle. These were also noticed in Muscat donkeys and in mules. A bibliography of eight works concludes this paper.

DA COSTA (B. F. B.), SANT'ANNA (J. F.), DOS SANTOS (A. C.) and ALVARES (M. G. de A.) **Sleeping Sickness: A record of four years' war against it in Principe, Portuguese West Africa.**—*Published for the Centro Colonial, Lisbon, by Baillière, Tindall and Cox, London,* 1916, xii + 260 pp., 75 plates, 3 maps.

The first part of this report deals with the introduction of sleeping sickness into Principe during the early part of last century and the gradual spread of the disease in that island, the geography and natural conditions of which are described at some length. The tropical forests which originally covered the greater part of the island have been cleared to a large extent and have become replaced by bush and herbaceous vegetation. The savannah type is unknown. The principal indigenous mammals met with are *Cercopithecus mona*, *Viverra civeta* (civet-cat), field-rats, mice, and frugivorous and insectivorous bats.

Before measures were undertaken on a large scale, *Glossina palpalis* was present throughout the island with the exception of the southern part. This distribution is correlated with that of wild pigs, on which the flies feed. The plan of campaign against sleeping sickness in the island is described, an account of the measures adopted having already been published [see this *Review*, Ser. B, ii, pp. 13–16 and 121–124]. These have been completely successful, and in 1914 it was announced that *G. palpalis* had disappeared from the island. This being the case, it is recommended that the Medical Mission be dissolved in a few months, the duties of sanitary supervision being transferred to two doctors, while the health officer retains thirty permanent employés and one European overseer.

A bill drafted by the Mission contains the following recommendations:—(1) Natives from infected regions not to be admitted into the island; patients suffering from the disease not to be allowed to leave the island without special permission; compulsory internment of existing cases of sleeping sickness in the State isolation hospital; permanent medical supervision for all the inhabitants of the island; obligatory notification of all future cases of human trypanosomiasis. (2) Prohibition of the importation of animals from regions infested by tsetse-flies except for immediate slaughter; prohibition of rearing of domestic animals, except in the southern part of the island; total prohibition of pig-breeding; restriction of the canine population of the island. (3) Compulsory annual cleaning by the owners of all lands not under cultivation; periodical improvement of the beds of streams and swamps; prevention of growth of thick forest under 600 feet above sea-level; compulsory notification of the reappearance of *Glossina* in any part.

The blood-sucking insects of the island, other than *G. palpalis*, found in 1913–14, included:—TABANIDAE: *Tabanus congoiensis*, *T. taeniola*; Muscidae: *Stomoxys nigra*; Culicidae: *Toxorhynchites* sp., *Culiciomyia nebulosa, Banksinella luteolateralis, Stegomyia fasciata, Anopheles* (*Pyretophorus*) *costalis*, and *Culicoides milnei*. Parasites of the genus *Herpetomonas* were found in the gut of *T. congoiensis* and *S. nigra*.

Legendre (J.). **Sur l'existence dans la Somme du** *Phlebotomus papatasii*, **Scop.** [On the existence in the Somme of *Phlebotomus papatasii.*]—*C. R. Soc. Biol.*, ***Paris***, lxxix, no. 1, 8th January 1916, pp. 25–26.

Phlebotomus papatasii has previously been recorded from several localities in southern France, viz., from Montpellier, Beaune, Saint-Cyr, etc. It is now reported from Vignacourt during the first fortnight in July.

Legendre (J.). **Sur un nouveau Mode de Transport des Larves de Moustiques.** [On a new Method of transporting Mosquito Larvae.] —*C. R. Soc. Biol., Paris*, lxxxix, no. 1, 8th January 1916, pp. 26–27.

The larvae of *Culex* sp. collected in a ditch in December were removed from water and placed under the following conditions:—(1) Between two layers of damp moss in an uncovered box; (2) between similar layers in a box provided with a lid pierced with holes; and (3) three layers of larvae, separated by layers of damp moss, enclosed in an hermetically sealed box. The boxes were opened after five days; the larvae, upon being again placed in water, became active and appeared to develop normally. These experiments show that the larvae of *Culex* can survive out of water and in a closed vessel for at least 5 days, a fact which greatly facilitates their transport.

da Silva (P.). **Expériences sur la transmission de la leishmaniose infantile par les Puces** (*Pulex irritans*). [Experiments on the transmission of infantile Leishmaniasis by *Pulex irritans.*]—*Arquivos Inst. Bact. Camara Pestana*, ***Lisbon***, iv, no. 3, 1915, pp. 261–267. [Reprint.]

The rôle played by *Ctenocephalus canis* and *Pulex irritans* in the transmission of human and canine kala-azar has not yet been completely elucidated. In the experiment here described, 25 *P. irritans*, free from infection, were allowed to feed on a child in an advanced state of kala-azar. These 25 fleas in 484 feeds all gave negative results, though the number of feeds and the length of their lives were sufficient to permit of the evolutive cycle of any parasites ingested. In consequence of these results and of those of Wenyon and Patton, it must be concluded, until the contrary be proved, that neither *C. canis* nor *P. irritans* are agents in the transmission of human and canine kala-azar.

Изъ работъ “**Комиссіи по выработкѣ мѣръ борьбы съ насѣкомыми, разносителями эпидемическихъ заболѣваній**”. [Reports of “the Commission for the investigation of remedies against insects which carry epidemic diseases.”]—**«Извѣстія Московскаго Энтомологическаго Общества.»** [*Bulletins of the Moscow Entomological Society*], *Moscow*, vol. 1, 28th November 1915, pp. 162–184. [Received 27th January 1916.]

The following are the first three reports of this Commission, which has been founded by the Moscow Entomological Society under the chairmanship of Professor N. M. Kulagin.

1. ENGELHARDT (V. M.). **Вліяніе температуръ, сухости воздуха и пропитыванія тканей различными веществами на жизнеспособность взрослыхъ вшей.** [The effect of the temperature, the dryness of the air and the soaking of fabrics with various substances on the vitality of adult lice], pp. 164–170.

The fatal effect of high temperature on lice is already well known and various methods of utilising it for their control have been devised. The author's experiments were limited to temperatures not higher than the average temperature of the human body, from which it appears that lice were able to live without food for 2 to 5 days at a temperature of 85° F. in wet air and for 2 to 3 days in dry air; at 68° F. they lived for 3 to 6 days in wet air and for 2 to 4 days in dry air, while at 60° F. the respective number of days were 4 to 6 and 4 to 5; thus the length of life of lice without food is in direct proportion to the moisture of the air and in inverse proportion to the temperature. Experiments on the soaking of fabrics with various substances were made with birch tar, turpentine, kerosene and combinations of these substances. The kind of birch tar employed, whether crude, rectified, black, or white, is of no great importance, and for practical purposes a 5 per cent. solution of crude birch tar may be applied, which, although it somewhat discolours the linen, will keep away lice for 10 to 15 days; white birch tar is more expensive and rather less effective. Turpentine gave good results, but is very volatile; kerosene does not soil the linen, but is not lasting in its effect, and sometimes affects the skin. Combinations of these three substances proved stronger in their effect than each of them separately, particularly a solution of 1 per cent. of rectified birch tar in a 50 per cent. kerosene emulsion, and another containing 10 parts of Russian turpentine and 5 parts of rectified birch tar in 500 parts of water. Good results were also obtained by the application of creoline in a 1 per cent. solution in water.

2. MUSSELIUS (A. A.). **Опыты и наблюденія надъ питаніемъ платяныхъ вшей и надъ дѣйствіемъ на нихъ нѣкоторыхъ душистыхъ веществъ.** [Experiments and observations on the feeding of clothes lice and on the effect of various odorous liquids on them.] pp. 170–179.

Records of several series of experiments with different ethereal oils are given. From the first of these, it appears that oil of origanum (marjoram) had the most rapid effect, while oil of cloves is more rapid in its action, but less effective than that of cinnamon or bergamot.

The second series of experiments carried out was with oil of cajeput, oil of anise, and oil of sassafras, the first-named being the most rapid in its action. Further experiments showed that the addition of naphthaline to the above oils hastened their action.

3. Vishnjakov (Th. A.). **Изслѣдованіе вліянія нѣкоторыхъ матеріаловъ, могущихъ быть употребляемыми при мойкѣ бѣлья въ растворѣ съ водой на жизненность взрослыхъ платяныхъ вшей.** [Investigations on the effect of various substances likely to be employed in water, when washing linen, on the vitality of adult clothes lice], pp. 179–183.

The author has experimented on the effects of soda, borax, boric and salicylic acids on lice, all of which substances are likely to be used when washing linen. The experiments were conducted at 60° to 63° F., and consisted in submerging the lice for some time in glasses containing the above solutions. It was found, however, that only submersion for 48 hours in saturated solutions of soda or for 8 hours in saturated solutions of salicylic acid were harmful to the parasites. Other experiments showed that the most effective solutions against lice are ½ per cent. and 5 per cent. solutions of pure and white birch tar, a 1 per cent. solution of creolin, and 1 per cent. and 10 per cent. solutions of crude eau-de-javelle.

Portchinsky (I. A.). **По интересному, но мало изслѣдованному вопросу о свойствахъ жучка хищника** *Paederus fuscipes*, Curt. [About the interesting, but little investigated question of the habits of *Paederus fuscipes*, Curt.]—**«Любитель Природы.»** [*Friend of Nature*], *Petrograd*, no. 12, December 1915, pp. 364–366.

The author refers to the occurrence of the Staphylinid, *Paederus columbinus*, in Brazil, and of *P. fuscipes*, Curtis, in Astrachan [see this *Review*, Series B, iii, p. 68], and urges further investigation into the poisonous qualities of these insects, especially as regards the method of ejection and the nature of the irritant liquid.

Roberg (D. N.). **i. The Rôle played by the Insects of the Dipterous Family Phoridae in Relation to the Spread of Bacterial Infections. ii. Experiments on** *Aphiochaeta ferruginea*, **Brunetti, with the Cholera Vibrio.**—*Philippine Jl. Sci.*, *Manila*, x. Sec. B., no. 5, September 1915, pp. 309–336. [Received 27th January 1916.]

The experiments recorded in this paper were undertaken in order to determine whether *Aphiochaeta ferruginea*, Brunetti, is a carrier of disease and whether, if such is the case, it can be considered as important as *Musca domestica*, *Stomoxys calcitrans*, *Lucilia*, etc.

Complete life-histories of members of the family Phoridae have been worked out in very few cases. Those species which have been reared have been bred on fungi and dead or decaying vegetable or animal matter. Some have been reared from snails and a few from bees, ants, or beetles. *Conicera atra*, Mg., *Phora aterrima*, F., *Trupheoneura opaca*, Mg., *T. trinervis*, Beck., *T. perennis*, Mg., *Dohrniphora abdominalis*, Fall., *Chaetoneurophora caliginosa*, Mg., and *C. ora curvinervis*, Becker, have been obtained from decaying animal matter.

An account of the characters of the family and a description of *A. ferruginea* are given. According to Brunetti, this species requires from 12 to 15 days for the first generation to emerge. Pupation takes place from 5 to 8 days after oviposition, and the emergence of adults occurs 7 days later. *A. ferruginea* is the commonest of the small flies breeding in human faeces. The minute size of the flies enables them to pass through ordinary fly-proof screens used against the house-fly and other large Diptera. The results obtained in the experiments afford evidence that this insect is a possible carrier of Asiatic cholera, and by analogy, other alimentary infections, such as typhoid fever, bacillary dysentery, and infantile diarrhoea, may be transmitted, either through the ingestion of food contaminated by organisms from the surface of the fly's body or faeces, or by ingestion of the entire fly which may have become mixed up with the food. Fly-proof sanitary pails which are proof against the common house-fly may not be secure against invasion by PHORIDAE. The fact that cholera vibrios may be transmitted from larvae, through pupae, into adults is important only under exceptional circumstances. In the Philippine Islands, where there are many questions unsolved in the epidemiology of Asiatic cholera, the PHORIDAE are worthy of serious consideration.

SCHÜFFNER (W.). **Pseudotyphoid Fever in Deli, Sumatra (a variety of Japanese Kedani Fever).**—*Philippine Jl. Sci., Manila*, x Sec. B., no. 5, September 1915. pp. 345–353, 3 plates, 3 tables. [Received 27th January 1916.]

Kedani fever appears in Japan at certain times of the year which are determined by periodical floods. In Sumatra no such regularity can be observed. The disease occurs most frequently from June to August and from November to January; the former period is dry, the latter has the greatest rainfall. The mortality due to the disease differs in the two countries; in Japan, it is on an average 30 per cent. and is dangerous in advanced age, while in Sumatra mortality is about 3 per cent. The carrier of the disease in Japan is the larval form of a species of *Trombidium.* The host of this mite is the field mouse, which harbours the parasite about the ears. The transmitter in Deli is either a tick or mite. Labourers on estates in which the disease occurs suffer from attack by the larvae of *Trombidium* sp. and *Cheyletus* sp. The bite of the Deli form of mite causes violent irritation for about fifteen minutes, while that of the Japanese variety may remain unnoticed for several days. In Deli another host of the tick or mite probably occurs, just as in Japan. Though the pseudotyphoid of Deli would appear to be much less fatal than the kedani of Japan, there are many points of resemblance between the two diseases. Skin affections are an essential part of both, and an eruption appears on the second or third day of the disease and attains its full development on the sixth to eighth day. The course of the fever corresponds in all respects to that seen in enteric fever. In the blood a diminution of polymorphonuclear forms and an increase in lymphocytes is constantly found. The lungs and bronchi may be involved and in fatal cases extensive bronchopneumonia has been found. Agglutination tests with the patients' serum for *B. typhosus*, *B. paratyphosus A*, and *B. paratyphosus B*, as well as attempts to cultivate organisms from the blood, met with no result.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.

Notes on New Species of Fleas .. 33
New American Fleas .. 33
The Bibliography of the Ixodoidea .. 34
A Monograph of the Ticks of the Genus *Haemaphysalis* .. 34
Fleas in relation to Disease .. 34
Cod-liver Oil against Flies on Horses .. 34
Fleas infesting Man and Animals in the U.S.A. .. 34
The Control of Lice in Germany .. 35
A Summary of Information concerning Tsetse-Flies .. 36
Blood-sucking Insects of Eastern Brazil .. 36
The Tabanidae of Brazil .. 37
Notes on Chagas' disease in Brazil .. 37
Hunterellus hookeri, a Parasite of *Rhipicephalus sanguineus* in Brazil 39
Stegomyia fasciata in Hong Kong .. 39
New Species of *Simulium* from East Africa .. 39
The Risks of the Introduction of Yellow Fever into Morocco .. 40
Oestrid Flies parasitic on Elephants in the Belgian Congo .. 40
Pneumotuber macaci parasitic in the Lungs of Monkeys .. 40
Mosquitos and House-flies in Fiji .. 41
New Australian Blood-sucking Flies belonging to the Family Leptidae .. 41
Babesiasis and Trypanosomiasis in the Gold Coast .. 42
The Distribution of *Glossina palpalis* in the Lomami District of the Belgian Congo .. 43
Experiments on induced Herpetomoniasis in Birds .. 43
Ornithodorus moubata in Warthog Burrows in Northern Rhodesia 44
Mosquitos and Malaria in Sierra Leone .. 44
Blood-sucking Diptera of Sierra Leone .. 44
Mosquito Investigations in Sierra Leone .. 45
Insects in Relation to Disease .. 45
Tyroglyphus longior var. *castellanii* causing Copra Itch in London 46
Diseases carried by Ticks in Rhodesia .. 46
The Oxidation of Arsenical Dipping Fluids in Rhodesia .. 46
The Distribution of *Glossina* in German East Africa .. 47
The Eradication of *Glossina palpalis* in the Island of Principe .. 48
The Occurrence of *Phlebotomus papatasii* in France .. 49
On a new Method of transporting Mosquito Larvae .. 49
Experiments on the Transmission of Infantile Leishmaniasis by *Pulex irritans* .. 49
The Control of Lice in Russia .. 50
The poisonous Character of *Paederus fuscipes* in Astrachan .. 51
Aphiochaeta ferruginea, a Carrier of the Cholera Vibrio in the Philippines .. 51
Kedani Fever and its Carriers in Sumatra and Japan .. 52

VOL. IV. Ser. B. Part 4.—pp. 53-68. APRIL, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., *Chairman.*

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.
Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.
Mr. Guy A. K. Marshall.

Assistant Director.
Mr. S. A. Neave.

Assistant Editor.
Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—27, Elvaston Place, London, S.W.

KING (W. V.). **The Rôle of *Anopheles punctipennis*, Say, in the transmission of Malaria.**—*Science, Lancaster, Pa.*, xlii, no. 1094, 17th December 1915, pp. 873-874.

As the result of recent experiments conducted in New Orleans, Louisiana, it has been proved that *Anopheles punctipennis* is an efficient medium for the development of the sexual cycle of *Plasmodium vivax*, the organism of tertian malaria. *A. punctipennis* is common in the United States and owing to its abundance and wide distribution, the question of its agency in the spread of malaria is important. The fact that *A. punctipennis* is a host of tertian malaria does not necessarily indicate that it is an efficient carrier of other forms of malaria. Previous experiments by Hirschberg suggest that this is not the case.

KAUPP (B. F.). **Some Experiments with Agents calculated to kill the *Trombidium holosericeum*.**—*Science, Lancaster, Pa.*, xliii, no. 1097, 7th January 1916, pp. 33-35.

Trombidium holosericeum (common fowl mite) occurs throughout the United States. It is very troublesome during July and August, when conditions are favourable for rapid multiplication. The effect of certain insecticides, including sulphur, Paris green, naphthaline, carbolic acid, etc., upon the mites was tested. Powdered sulphur, air-slaked lime, and Paris green, in the dry state, had no effect on the mites. Naphthaline, or powdered moth balls, killed all mites in 45 minutes, by virtue of the volatile substances emitted. Insect powder containing gasoline and crude carbolic acid killed the mites in 1 minute. Solutions sufficiently concentrated killed in the following lengths of time : Crude carbolic acid, 20 seconds ; 5 per cent. carbolic acid, 1 minute ; 1 per cent. naphthaline in kerosene, 30 seconds ; 1 per cent. kreso dip, 10 minutes, and 2 per cent., 4 minutes ; 10 per cent. formaldehyde, 10 minutes. The substances used, to be effective, must be in solution or be capable of giving off volatile substances which are themselves destructive.

NOEL (P.). **Les mouches, les moustiques, les poux et les rats dans les tranchées.** [Flies, mosquitos, lice and rats in the trenches.]—*Bull. Trim. Lab. Entom. Agric. Seine Infér., Rouen*, January-February-March 1916, pp. 9-15.

Dr. Loir, chief of the Service d'Hygiène at Hâvre, recommends the following preventive against body lice :—One part each of naphthaline and camphor with sufficient benzine to render them miscible, mixed with sawdust, 3 parts by weight. This mixture is placed in small, flat sachets measuring 1½ by 2¼ inches, which are worn next the skin.

A Good Fly Glue.—*Queensland Agric. Jl., Brisbane*, iv, no. 6. December 1915. p. 352.

The following mixtures are recommended for trapping flies :—(1) 6 parts colophony, 4 parts rape-seed oil, and 3 parts resin, melted together ; (2) 8 parts resin, 4 parts each of turpentine and rape-seed oil, and ½ part honey ; (3) 1 lb. resin, 3 oz. each of molasses and linseed oil, boiled together to form a thick paste.

(C254) Wt.P1/106. 1,500. 4.16. B.&F.Ltd. Gp.11/3.

Strickland (C.). **Short Key to the Identification of the Larvae of the Common Anopheline Mosquitos of the Malay Peninsula.**—*Kuala Lumpur,* 1915, 18 pp., 7 plates. [Received 27th January 1916.]

A key is given to the full-grown larvae of Malayan Anophelines, based on the characters of the clypeal and palmate hairs, and of the antennae.

Shircore (J. O.). **A Note on some Helminthic Diseases, with special reference to the House-fly as a natural carrier of the Ova.**—*Parasitology, Cambridge,* viii, no. 3, January 1916, pp. 239–243.

Examination at Mombasa of local natives who complained of intestinal troubles showed evidence of helminthiasis in 83 per cent. of the cases investigated. Ova of the following parasitic worms were found :—*Ankylostoma duodenale, Ascaris lumbricoides, Trichocephalus dispar, Taenia saginata, Schistosomum mansoni, Oxyuris vermicularis* and *Strongyloides stercoralis.* Flies from one of the wards of the native hospital, in which a number of cases of helminthiasis were contracted, were examined. Ten out of 100 flies contained ova of *T. dispar, T. saginata* or *A. duodenale*; of 100 flies caught in the police lines, 11 harboured ova, and of 25 caught in the meat market two contained ova. These captures were made at mid-day; in captures made at 6.30 a.m. in the bazaar and in the hospital no eggs were found. The females contained ova more frequently than the males. Although human faeces showed a high infection with *A. duodenale* and *A. lumbricoides,* the ova of these species were found in flies on very few occasions. The eggs of *T. dispar* and *T. saginata,* although less common in human faeces, were comparatively abundant in the flies. The order of frequency of ova in the flies was :—*T. dispar* 16, *T. saginata* 8, *A. duodenale* 5, *A. lumbricoides* 1, and *S. mansoni* 1. The small number of eggs of *A. lumbricoides* found in the flies was probably due to their large size. The ova of *T. dispar* appeared able to withstand putrefaction in dead flies for nearly two months.

Strickland (C.). **Considerations regarding an Outbreak of Malaria at Morib, Federated Malay States.**—*Parasitology, Cambridge,* viii, no. 3, January 1916, pp. 249–254.

Investigation into the nature and causes of a recent outbreak of malaria at Morib, Federated Malay States, has shown that the whole population is subject to fever, and the fact that children of the stationary population suffer and present signs of chronic disease proves almost conclusively that the fever is endemic there. Five species of *Anopheles* were captured, viz., *A. ludlowi, A. rossi, A. umbrosus, A. sinensis,* and *A. tessellatus*; of which *A. ludlowi, A. umbrosus* and *A. sinensis* are known to be carriers of malaria in the Andamans, India and Borneo. From a record of captures and dissections, it is probable that most of the fever at Morib was due to *A. ludlowi,* and slightly to *A. umbrosus*; *A. rossi* and *A. sinensis* were probably negligible factors.

The outbreak shows the great practical importance of obtaining an exact comparative infectivity table of the various Anophelines. At Morib, the statement that *A. ludlowi* was the cause of the fever is based on general considerations only. Hill-land malaria in Malaya, and perhaps in India, is probably so difficult to control because it is conveyed by mosquitos of high infectivity and low prevalence, whereas low-land malaria can be prevented because it is carried by mosquitos of low infectivity and high prevalence.

Nuttall (G. H. F.). **Notes on Ticks. iv.**—*Parasitology, Cambridge,* viii, no. 3, January 1916, pp. 294–337, 21 figs.

The following new ticks are described :—*Ixodes eichhorni*, sp. n., found on the person of a collector at Rook Island, German New Guinea, and on a kingfisher in the Admiralty Islands ; *I. victoriensis*, sp. n., on *Phascolomys*, in Victoria, Australia ; *I. nairobiensis*, sp. n., on a dog at Nairobi ; *I. ricinus* var. *gibbosus*, var., n., on *Capra hircus*, in Smyrna, in company with *Hyalomma aegyptium* and *Haemaphysalis cinnabarina* var. *punctata* ; *I. dentatus* var. *spinipalpis*, var. n., on *Lepus americanus* and *Sciurus hudsonius* in Western Canada.

Additional stages of the following species are described :—*I. japonensis*, Neum., from Yunnan on the borders of China and Tibet, Upper Burma and Japan ; *I. nuttalli*, Lahille, from Peru ; *I. auritulus*, Neum., on an undetermined bird from the Straits of Magellan, on *Trupialis militaris* from Tierra del Fuego, on a thrush from Peru, on a bird from Costa Rica, and on *Haliaetus leucocephalus alascanus* from Canada. Species redescribed include :—*I. granulatus*, Supino, on *Sciurus* spp. and *Felis tigris* in Burma, and on *Epimys rufescens* in India ; *I. anatis*, Chilton, on *Anas superciliosa* and *Apteryx mantelli* from New Zealand ; *I. eudyptidis*, Mask., on penguins, New Zealand ; *I. tasmani*, Neum., on *Trichosurus vulpecula* and *Dasyurus maculata* in Australia.

Malloch (J. R.). **Some Additional Records of Chironomidae for Illinois and Notes on other Illinois Diptera.**—*Bull. Illinois State Lab. Nat.-Hist., Urbana,* xi, Article 4, December 1915, pp. 305–363, 6 plates.

These notes on blood-sucking midges include the following species :—*Culicoides guttipennis*, Coq., occurring commonly in June and July 1915 ; *C. stellifer*, Coq., biting man in August ; *C. sanguisugus*, Coq., a common species in towns ; *C. haematopotus*, Malloch, taken in May and June ; *C. biguttatus*, Coq., not previously recorded from Illinois ; and *Pseudoculicoides griseus*, Coq., biting man early in May. The author expresses the opinion that the species which he described as *P. major* may be synonymous with *P. griseus*. Several specimens of *Ceratopogon peregrinus*, Johannsen, were found on 7th July feeding on a dead worm. The genus *Neoceratopogon* is erected for *Ceratopogon bellus*, Coq. Descriptions are also given of *Forcipomyia elegantula*, sp. n., *Euforcipomyia hirtipennis*, gen. et sp. n., *E.* (*Ceratopogon*) *fusicornis*, Coq., *Johannsenomyia albibasis*, sp. n., the male of which bears a striking resemblance to *Probezzia pallida* which occurred with it, and *Probezzia infuscata*, sp. n.

The Bot-Fly.—*Queensland Agric. Jl., Brisbane*, v, no. 1, January 1916, p. 36.

To protect horses from the attacks of the bot-fly (*Gastrophilus equi*) the chin and knees should be smeared daily with the following dressing: Oil of tar, 1 oz.; olive oil, 6 oz. If the parasites are observed to be present, the animal should receive 2 oz. of oil of turpentine and 1 pint of raw linseed oil, followed in a few days by a dose of Barbados aloes.

Rodhain (J.). **La maladie du sommeil dans l'Ouellé (Congo belge) à la fin de 1914.** [Sleeping sickness in Welle (Belgian Congo) at the end of 1914.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 1, 12th January 1916, pp. 38–72, 1 map, 6 tables.

The district of Welle, which is abundantly watered by important rivers, shows few undulations except in the south-eastern and eastern parts. Two types of vegetation can be distinguished, viz., the savannah and the equatorial forest. Three species of *Glossina* occur—*G. palpalis*, *G. morsitans*, and *G. fusca*. *G. palpalis* is found along the important rivers of the forest region and near the mouths of their tributaries. Certain rivers, notably the Tele and the Likati, show a much greater infestation than others. The banks of the water-courses are little frequented by man and the flies feed on the game present in these situations. In the region of the savannah, where the trees bordering the rivers are reduced to certain areas, the distribution of *G. palpalis* is correspondingly limited. In the valleys where the rivers are bordered by papyrus, as well as on the high plateau of Aru, this fly does not occur. It is rarely met with outside the wooded area, only leaving it when food is scarce or at times of flood.

G. morsitans occurs only in the extreme north-east, its area of distribution representing the south-eastern limit of the Soudanese extension of this species, which ranges across the Bahr-el-Ghazal and the tributaries of the Shari to the Niger and Dahomey.

G. fusca is found in small numbers throughout the forest region and in the savannah is met with at irregular intervals near the forests which border the rivers.

A systematic examination of the population of this region, carried out between 1912 and 1914, has led to the following conclusions:—(1) The entire western frontier of Welle is infected; passing eastwards, sleeping sickness is invading the territories of Ibembo and Monga. (2) The northern frontier and the regions of the French Congo bordering on the Mbumu as far as its source should be considered as infected. (3) A zone in which the malady is endemic exists at the extreme north-east, around Aba. (4) In the forest region, three small and very localised centres have been discovered. (5) The disease has become established along the banks of the Welle from Dungu to Suronga. There has thus been a considerable extension of the disease since 1907, when part of the territory was examined by Ollivier.

Prophylactic measures have been actively carried out in the known centres. Persons suffering from the disease have been treated either in hospital or in their own homes, according to the gravity of the case; the removal of patients from infected districts has been effected, and forests cleared at points frequented by the flies. Measures against the Azande focus must be limited to protecting the menaced frontiers by freeing the adjoining districts from infection. The want of doctors has, until recently, hindered active operations in central Welle, the geographical position of which alone renders control measures difficult. The powers of doctors and officials have been considerably increased by the new regulations of 29th September 1914, but to ensure success, the necessary supervision requires to be still more effective.

HIGGINS (J. T. D. S.). **Note on Cases of Phlebotomus Fever at an Island in the Eastern Mediterranean.**—*Brit. Med. Jl., London,* no. 2874, 29th January 1916, p. 166.

Eight cases of sand-fly fever occurred in a garrison under the author's charge. The infection was due to *Phlebotomus papatasii*, and the trouble ceased after the sleeping-places were moved from the ground floor, and after a neighbouring area covered with rubble and refuse was cleared and dressed with lime.

BACOT (A. W.). **The temperature necessary for the destruction of lice and their eggs.**—*British Med. Jl., London,* 29th January 1916.

The results described here are those of work undertaken because the points concerning temperature dealt with by Dr. Kinloch in connection with lice [see this *Review*, Ser. B, iii, p. 156] were so at variance with the author's experience regarding the heat necessary to kill other insects. Living specimens of lice, *Pediculus humanus* (*vestimenti*), were obtained and bred from in a box carried in a pocket where the insects had the advantage of the natural heat and humidity of the body. It was found that both the eggs and the lice (in their second instar) survived a thirty minutes' trial in an incubator (dry air) at 120·2° F., the lice being apparently unaffected, as they subsequently completed their development. Living lice, however, were killed by thirty minutes' submersion in water at 122·3° F.; at the same temperature in dry air, they were paralysed and 28 out of 32 specimens in all stages of growth died within a few hours, but four (two in the second and two in the third instars) survived. At 129·2° F. the lice were all dead thirty-five minutes after placing in the incubator and, up to the time of writing—three weeks after the test, no young had emerged from the eggs submitted to this temperature, though the control box was swarming with lice in all stages of growth. Eggs on pieces of cloth were dipped into water at 209·1° F. for one minute and a half-minute respectively, and, as was to be expected, they became an opaque white, presumably owing to the coagulation of the albumin. None of these hatched, though kept in the same pocket as the control eggs. A further test was carried out in a water bath to ensure greater accuracy. One batch of eggs was placed in a tube containing tap-water and another portion of the same batch was kept dry, in a similar tube. The tubes were submerged to within an inch of the rim in the water bath, the registered temperature of which was 131° F. After thirty minutes, the eggs were removed and kept with the control portion (in three separate boxes) in the same pocket. Up to the time of writing (sixteen days after the test) no eggs had hatched from the test boxes, though lice in various stages of growth were present in the control box. It is so improbable that lice having a long hatching period may survive a temperature which kills those which develop more rapidly, that the author concludes that dry heat or submersion in water at 131° F. kills both active lice and their eggs. It follows, as a consequence, that considerably lower temperatures than those usually employed may be used to kill these vermin. For the thorough sterilisation of infested garments, the question of penetration is all important. A considerable economy of fuel might probably be effected by allowing a longer exposure at a lower temperature, while it should be practicable to use quite lightly built chambers or temporarily adapted rooms to obtain dry air temperatures of, say, 140° F.

HALL (M. C.). **The Dog as a Carrier of Parasites and Disease.**—*U. S. Dept. Agric., Washington, D.C.*, Bull. no. 260, 23rd November 1915, 27 pp., 13 figs. [Received 9th February 1916.]

Investigations in the western United States indicate that the two common species of fleas attacking man, viz., *Ctenocephalus canis* and *Pulex irritans*, are carried by the dog. Both species are capable of transmitting bubonic plague to man, and *C. canis* is, in addition, a carrier of the tapeworm, *Dipylidium caninum*. *Echidnophaga gallinacea* (fowl flea), a common pest in some of the southern States, frequently infests dogs. In the States the dog is known to be the carrier of eleven species of ticks, the majority of which are parasites of man or stock. *Dermacentor variabilis* is commonly found on dogs, while *D. venustus* (spotted-fever tick) and *Margaropus annulatus* (Texas-fever tick) may occur on them. The dog is also affected by a form of mange due to the mite, *Sarcoptes scabiei canis*, and this disease may be transmitted to man. *S. scabiei ovis*, causing a rare form of sheep scab, may be carried by the dog, which is also a host of *Dermatophilus penetrans* (chigoe flea), occurring in tropical countries and indigenous in the southern portion of North America, as well as of the parasitic larvae of certain flies which habitually attack man and stock. These include *Dermatobia hominis* (*cyaniventris*), occurring in South and Central America, *Cordylobia anthropophaga* in Africa, and *Chrysomyia macellaria* in the United States. These parasites are especially liable to occur on stray dogs, which are thus a source of danger to the community and should be destroyed.

SCHUBERG & BÖING. **Ueber die Uebertragung von Krankheiten durch einheimische stechende Insekten.** [The transmission of diseases by native biting insects.]—*Centralbl. f. Bakt., Parasit. u. Infektionskr., Jena, Ite Abt. Referate*, lxiv, no. 8, 28th December 1915, pp. 227–228. [Abstract from *Arb. a. d. Kaiserl. Gesundheitsamte, Berlin*, xlvii, 1914, p. 491.]

With regard to the transmission of anthrax by *Stomoxys calcitrans*, the authors' experiments with large animals confirm those previously obtained by Schuberg and Kuhn ; it cannot be doubted that this fly conveys infection. Further experiments make it very probable that *Stomoxys* can convey streptococci in cases where the fly has shortly before (within a day) absorbed those which are pathogenic to the animal bitten. This probably applies to man also.

CARINI (A.). **Ueber die Hundekrankheit Nambi-uvu und ihren Parasiten,** *Rangelia vitalii.* [The dog disease Nambi-uvu and its Parasite, *Rangelia vitalii.*]—*Centralbl. f. Bakt., Parasit. u. Infektionskr., Ite Abt. Originale, Jena,* lxxvii, no. 3, 29th December 1915, pp. 265–271, 2 plates.

In Brazil there exists a serious infectious disease of dogs, which is characterised by jaundice, skin disorders and internal haemorrhage. In severe cases death ensues in from three to ten days. The disease is due to a Piroplasmid parasite which multiplies in the dog either by fission or by the formation of schizogonia. As schizogonia have never been noticed in *Piroplasma canis,* a genus has been erected for this parasite, which is named *Rangelia vitalii.* Ticks are believed to act as carriers, as town dogs are not attacked by the disease, which occurs among country dogs, especially those used for the chase, and both *Amblyomma cayennense* and *A. striatum* have been found on them. Injections of trypan blue (1–2 per cent., 10–20 ccm.) have given good results in the first stages of the disease, and according to Dr. Chagas, injections of quinine have cured many cases.

MORRIS (Staff-Surgeon L. M.). **Malaria in H.M. Ships "Hermione" and "Bristol," at Tampico, with special reference to methods of screening.**—*Jl. Royal Naval Med. Service, London,* ii, no. 1, January 1916, pp. 42–50, 1 sketch-map.

Malaria is very prevalent on the Panugo River, Mexico, from May to January, marshes and lagoons occuring on both sides of it. The crews of both vessels were attacked in spite of the measures taken. Two outbreaks occurred on the "Hermione," the first of 51 cases, which were contracted on the first night in the river when *Anopheles* swarmed on board, and the second, of 55 cases, which began after the first rains in May. The mosquitos present were *A. maculipennis,* a few species of *Culex* and a very few *Stegomyia.* On the day after arrival, brass wire gauze, as used in Panama, was placed over the posts and doors and muslin over other openings. Quinine was also administered. Efficient screening is difficult without the intelligent help of all officers and men, and lectures are necessary to bring this about. Ships proceeding to known malarial localities should be previously screened with wire gauze in the case of doors, hatches, scuttles and air-supply inlets. Coverings for other openings can be quickly improvised if reserve supplies of wire gauze and open-mesh muslin are available.

CUMPSTON (J. H. L.). **Australia and Yellow Fever.**—*Commonwealth of Australia Quarantine Service Publication no. 6, Melbourne,* 1st October 1915, 95 pp., 13 figs., 5 maps. [Received 11th February 1916.]

The endemic foci on the Pacific Coast of America at present constitute the most important possible sources of the introduction of yellow fever into Australia. The opening of the Panama Canal will bring other foci within the range of Australia. The greater distance of these latter, together with the care that will be exercised by the United States authorities, will, to a certain extent, reduce the risk of introduction. The prevalence in large numbers of *Stegomyia* in the northern parts of the eastern coast of Australia will permit of the rapid spread of the disease, and one of the serious aspects of the question is that epidemics of yellow fever frequently begin with a series of mild cases, the nature of which may be overlooked. The fact that trade between Queensland and America has already increased, combined with the great prevalence of *Stegomyia* in that State, points to the necessity of taking immediate measures to prevent any possible outbreak. The proposal put forward that there should be an Intelligence Officer, trained in sanitary administration, stationed at Panama to act as an outpost for Australia and Asia, is considered worthy of the warmest support. It would also be advisable for the Australian and New Zealand authorities to combine and station an officer in Samoa or Tahiti. The most important aspect of the yellow fever question, so far as Australia is concerned, is to reduce the mosquito population.

A mosquito survey, with special reference to *Stegomyia fasciata*, has been made in the principal coastal towns of North Queensland. *S. fasciata* and *Culex fatigans* were found in all the towns visited, while *Anopheles* (*Nyssorhynchus*) *annulipes* occurred in all except Thursday Island and Innisfail. Other mosquitos recorded in Townsville were :—*Anopheles barbirostris* var. *bancrofti*, Giles ; *Mucidus alternans*, Westw. ; *Calomyia priestleyi*, Taylor ; *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse ; *O. vigilax*, Skuse ; *Aedimorphus australis*, Taylor ; *Pseudohowardina linealis*, Taylor ; *Ochlerotatus* (*Culicada*) *annulatus*, Taylor ; *Culex squamosus*, Taylor ; *C.* (*Leucomyia*) *annulatus*, Taylor ; *C. annulirostris*, Taylor ; *Culex* (*Culicelsa*) *abdominalis*, Taylor ; *C. fuscus*, Taylor ; *C. paludis*, Taylor ; *C. simplex*, Taylor ; *C. sitiens*, Wied. ; *C. concolor*, R-D. (*tigripes*, Grp.) ; *Taeniorhynchus* (*Chrysoconops*) *acer*, Walk. ; *Mansonioides* (*Taeniorhynchus*) *uniformis*, Theo. ; *Finlaya poicilia*, Theo. ; *Aedeomyia venustipes*, Skuse ; *Ficalbia* (*Dixomyia*) *elegans*, Taylor ; *Uranotaenia albescens*, Taylor ; *U. propria*, Theo., and *U.* (*Anisocheleomyia*) *nivipes*, Theo.

A second survey of North Queensland showed that larvae of *S. fasciata* were present in water-holding receptacles throughout the towns visited. [See this *Review*, Ser. B, iv, p. 10.]

In addition to the records from Queensland, *S. fasciata* has been found at Grafton and Newcastle in New South Wales, and at Port Darwin in the Northern Territory. *S. scutellaris*, Walk., is uncommon in Australia. It has been recorded at Port Darwin, and occurs also in one locality in New Guinea. An allied species, *S. pseudoscutellaris*, Theo., appears to be more widely distributed. The resolutions of the International Sanitary Convention of 1912 and the regulations in force for the quarantine control of vessels arriving at and passing through the Panama Canal are given.

RANDONE (F.). **La comparsa di un focolaio di "febbre di tre giorni" in Siracusa.** [The appearance of a focus of Three Day Fever in Syracuse.]—*Malaria e Malattie dei Paesi Caldi*, *Rome*, vi, nos. 5-6. September-December 1915. pp. 247-249.

A small epidemic of three-day fever, which occurred in a household at Syracuse in the summer of 1915, is described. The symptoms were typical and *Phlebotomus* was very abundant. The family attacked had lately occupied a house of recent construction which was surrounded by old ruined walls.

da Costa Lima (A.) **Acção do pyrethro sobre os mosquitos.** [The effect of pyrethrum on mosquitos.]—*Brazil-Medico, Rio de Janeiro,* xxix, no. 37, 2nd October 1915, pp. 289–291.

Pyrethrum powder is said to be effective in destroying mosquitos when burnt in rooms at the rate of 15 grammes per 40 cubic feet of space, the room being kept closed for at least three hours. The effect was uncertain when the amount of powder was reduced to 10 grammes per 40 cubic feet.

Halberkann (J.). **Ueber Schutzmittel gegen Stechmücken.** [Protection against mosquitos.]—*Münchener Med. Wochenschr., Münich,* lxii, no. 41, 12th October 1915, p. 1407.

As a protective against mosquitos, *Pyrethrum roseum* has been recommended, but experiments made at Hamburg proved that a strong tincture did not deter *Stegomyia fasciata* from biting. It is doubtful whether odorous substances have a practical value as repellents; only such preparations as obstruct the tracheae seem to be of use. The "Mückenfluid" repeatedly referred to by Giemsa, has proved useful both in Germany and in German East Africa. The fluid is diluted in 20 parts of soft water and used as a fine spray. Pyrethrum was at first an ingredient, but has now been discarded, and this mixture now consists of a 2½ per cent. solution of potash soap or of 1½ per cent. soda soap and has proved very effective. Still better is a mixture of 50 grammes commercial formalin, 18 grammes Spir. sap. Kalin [Phar. Ger.], and 2 litres of water.

Vécsei (F.). **Beitrag zur Epidemiologie der Pest: Die Pest in Schanghai.** [A contribution to the epidemiology of plague: plague in Shanghai.]—*Wiener Klin. Wochenschr., Vienna,* xxviii, no. 52, 30th December 1915, pp. 1445–1449, 2 plans.

This paper describes the outbreak of plague in Shanghai and the measures adopted there against it. Owing to the protective measures taken on the Austrian warship "Kaiser Franz Joseph" during its stay at Shanghai, only three rats were seen on board. Seventy per cent. of the rats in Shanghai are *Mus rattus*, the remainder being *Mus decumanus*.

Barret (H. P.). **Notes on the Breeding places of Anopheles.**—*Amer. Jl. Trop. Dis. & Prevent. Med., New Orleans,* iii, no. 7, January 1916, pp. 406–410.

During a mosquito survey of Charlotte, North Carolina, and the vicinity in the spring and summer of 1915, one of the most interesting facts noted was the almost universal prevalence of the larvae of *Anopheles punctipennis* and the great variety of their breeding places. Wherever other mosquitos were breeding, *Anopheles* larvae were likely to be found. They occurred in company with *Culex restuans, C. territans, C. fatigans* (*quinquefasciatus*), *Ochlerotatus* (*Aedes*) *sylvestris, O.* (*A.*) *canadensis, Stegomyia fasciata* (*A. calopus*) and *Psorophora columbia.* The breeding places included:—Temporary collections of rain water; rain barrels, tubes, etc.; drainage ditches, small springs and streams; creeks and larger streams; the first two classes being artificial and the third and fourth natural.

MAZZUOLI (S.). **Osservazioni sulla peste aviaria.** [Observations on fowl plague.]—*Clinica Veterinaria, Milano,* xxxviii, no. 1, 15th January 1916, pp. 1–6.

A number of experiments are described which relate to the mechanism of transmission of fowl plague. In one of these, two fowls infested with *Argas persicus* were kept together in a cage, one having been inoculated with the virus. After death, which occurred after 36 hours, its body was allowed to remain near the other fowl, which was unaffected. The same negative result was obtained when the experiment was repeated.

HUTCHISON (R. H.). **Notes on the preoviposition Period of the House Fly,** *Musca domestica,* **L.**—*U.S. Dept. Agric., Washington, D.C.,* Bull. no. 345, 5th February 1916, 14 pp., 1 fig., 3 tables.

Experiments on the preoviposition period of *Musca domestica* were carried out at Arlington, Va., and New Orleans during 1913 and 1914. Laboratory-bred flies were used in the investigations, originating from larvae or pupae found in manure heaps. Adult flies were kept in cages 22 inches high by 12 inches square ; the cages were protected from the direct rays of the sun, but were exposed to air currents and to outdoor conditions of temperature and humidity. Flies were transferred to the cages soon after emergence and were supplied with food and media for oviposition. The preoviposition period was found to vary between 2½ and 23 days. The shortest records occurred in midsummer, and the longer ones during autumn, thus showing that temperature has a marked influence on the length of the period. It is also dependent on humidity, quality of food of adults, and quality of the larval food with the resulting effect on the size and physiological condition of the adult. Lack of water proved fatal to adults. Bananas, water and manure were found to be suitable foods. In experiments with isolated pairs of flies very few results were obtained ; this suggests that the association of a number of females in the process of egg-laying is the normal habit and that isolation has an inhibiting effect. The date of pairing varied from the first to the forty-seventh day after emergence, and pairing did not occur when the temperature was below 55° F. The maximum longevity was 70 days, the minimum less than one day, while the average of the records of about 3,000 flies was slightly more than 19 days.

Sur l'action des capsules de sulfure de carbone contre les larves de *Gastrophilus equi.* [On the action of capsules of carbon bisulphide on the larvae of *Gastrophilus equi.*]—*Recueil de Méd. Vét. publié à l'Ecole d'Alfort, Paris,* xcii, nos. 1–2, 15th January—15th February 1916, p. 105.

This article records the successful use of capsules of carbon bisulphide in killing larvae of *Gastrophilus equi* in horses. In this case three horses were first purged with 20 grammes of extract of aloes, and on the following day four 10-gramme capsules were administered at one-hour intervals, before feeding. From the next day onwards, numerous dead Oestrid larvae were expelled ; no injurious effect was observed in the animals.

Chatton (E.) & Blanc (G.). *Cryptoplasma rhipicepahli*, **n. g., n. sp., Protiste endoparasite de la Tique,** *Rhipicephalus sanguineus*, **du Gondi** (*Ctenodactylus gundi*). [*Cryptoplasma rhipicephali*, gen. et., sp. n., a Protozoan endoparasite of the tick, *Rhipicephalus sanguineus*, from the Gondi.]—*C. R. Soc. Biol. Paris* lxxix, no. 3, 5th February 1916, pp. 134–138, 2 figs.

Rhipicephalus sanguineus, Latr., is one of the most common parasites of the gondi, a rodent occurring in south Tunis. This tick is found also on the dog, rabbit and some birds and may be connected with the cases of *Toxoplasma* among these hosts. It is probably a transmitter of *Piroplasma quadrigeminum*, Nicolle, with which the gondi is infected to a high degree. Investigations in connection with *Toxoplasma* led to the discovery of a new parasite, *Cryptoplasma rhipicephali*, occurring in the alimentary tract or body cavity of a single nymph. This parasite is described and compared with the Haemogregarine of the gecko, *Tarentola mauritanica*.

Townsend (C. H.). U.S. Bur. Entom. **The Insect Vector of Uta, a Peruvian Disease.**—*Jl. of Parasitology, Urbana, Ill.*, ii, no. 2, December 1915, pp. 67–73, 1 fig.

The disease known as "Uta," occurring on the west face of the Andes in Peru, has been proved to be due to a *Leishmania*, and *Forcipomyia utae* and *F. townsendi*, native to the western Andean region, appear to be proved capable of transmitting this parasite, which is voided by them from the anus while feeding. Infection must take place when the bites are rubbed. The seasonal prevalence of the disease from November to April, which are the rainy months, coincides with the period of greatest prevalence of the insects. It may prove that these midges, while normally confining their attacks to other insects, have become accustomed, during their periods of greatest abundance, to transfer their attacks to man owing to a shortage of the food-supply. That other insects also transmit *Leishmania* is very probable. Certain Tabanids probably carry the organism of "apaicha" in the eastern rain-forest region. In the Amazonas province of Peru the natives accuse a new species of *Ornithodoros* allied to *O. turicata*, Dugés, of carrying "uta" by its bites, but this is considered improbable. Fleas, bed-bugs and ticks seem excluded in the case of this disease and other Peruvian leishmaniases, as the lesions are practically confined to the exposed parts of the body.

Ransom (B. H.) & Hall (M. C.). **The Life-History of** *Gongylonema, scutatum*.—*Jl. of Parasitology, Urbana, Ill.*, ii, no. 2, December 1915, pp. 80–86.

Sheep fed upon insects containing the larvae of *Gongylonema scutatum*, become infested with this Nematode. Its eggs are present in their faeces and hatch out when swallowed by insects of various species. *Gongylonema* larvae have been found in various species of dung beetles collected from sheep manure, namely, *Aphodius femoralis*, *A. granarius*, *A. fimetarius*, *A. coloradensis*, *A. vittatus*, *Onthophagus hecate*, and *O. pennsylvanicus*. They have also developed in various species of *Aphodius* and in the cockroach, *Phyllodromia* (*Ectobia*) *germanica*.

CRAWLEY (H.). **Note on the stage of** *Piroplasma bigeminum* **which occurs in the cattle-tick,** *Margaropus annulatus.—Jl. of Parasitology, Urbana, Ill.*, ii, no. 2, December 1915, pp. 87–92, 1 fig.

A parasitic protozoan, found in smears made from female cattle-ticks (*Margaropus annulatus*) and from crushed eggs, is believed to represent the stage of *Piroplasma bigeminum* occurring in the tick. In the present case, the unusual mortality of the ticks would suggest that the parasite is pathogenic to them as well as to cattle.

NUTTALL (G. H. F.). **Ticks of the Belgian Congo and the Diseases they convey.**—*Bull. Entom. Research, London*, vi, no. 4, February 1916, pp. 313–352, 48 figs.

The subject of ticks and tick-borne diseases is of great importance to agriculturists and pathologists in the Belgian Congo. Of the species recorded from the Congo, one conveys relapsing fever to man and eight have been shown to carry diseases to domestic animals in various parts of Africa. After giving a brief summary of the classification of the group, the general characters of the different genera, and the biology of ticks, the author gives a more detailed account of the species found in the Belgian Congo, and their relation to disease. The species recorded include *Ornithodorus moubata*, Murray, conveying relapsing fever to man in many parts of tropical Africa ; *Haemaphysalis leachi*, Aud., carrying canine piroplasmosis ; *Rhipicephalus appendiculatus*, Neum., transmitting African Coast Fever in cattle ; *R. capensis*, Koch, found experimentally to carry African Coast Fever ; *R. evertsi*, Neum., carrying equine piroplasmosis ; *R. sanguineus*, Lat., a carrier of canine piroplasmosis in India and probably also in Africa ; *R. simus*, occasionally carrying Rhodesian fever in cattle ; *Margaropus* (*Boophilus*) *decoloratus*, Koch, conveying bovine piroplasmosis throughout tropical and southern Africa ; *Hyalomma aegyptium*, probably a transmitter of *Nuttallia equi*, causing biliary fever in horses ; and *Amblyomma hebraeum*, Koch, carrying " heartwater," a frequently fatal disease in sheep, goats and cattle. The best methods of collecting, preserving and breeding ticks in captivity are described. An index to Congo ticks and their hosts is appended.

EDWARDS (F. W.). **Eight New Mosquitos in the British Museum Collection.**—*Bull. Entom. Research, London*, vi, no. 4, February 1916, pp. 357–364, 5 figs.

The following new species of mosquitos are described :—*Ochlerotatus oreophilus*, from North India ; *O. eatoni*, from Madeira ; *Culex nilgiricus*, from Madras ; *C. ingrami*, from Ashanti ; *C. pacificus*, from New Hebrides ; *Eretmopodites dracaenae*, from Sierra Leone ; *Wyeomyia grenadensis*, from Grenada ; and *Anopheles domicolus*, from Northern Nigeria.

WATERSTON (J.). **Chalcidoidea bred from *Glossina morsitans* in Nyasaland.**—*Bull. Entom. Research, London,* vi, no. 4, February 1916, pp. 381–393, 9 figs.

Five species of Chalcidoid parasites, bred from puparia of *Glossina morsitans* in Nyasaland, are described. These are:—CHALCIDIDAE: *Haltichella edax,* sp. n., *Stomatoceras micans,* Wtrst., *S.* (*Centrochalcis*) *exaratum,* sp. n. ENCYRTIDAE: *Eupelminus tarsatus,* sp. n. EULOPHIDAE: *Syntomosphyrum glossinae,* Wtrst. The last-named species is a hyper-parasite of *G. morsitans* through *Mutilla glossinae,* Turn.

RICARDO (Gertrude). **Two New Species of *Haematopota* from the Federated Malay States.**—*Bull. Entom. Research, London,* vi, no. 4, February 1916, pp. 403–404.

Haematopota stantoni, from Kuala Lumpur and Selangor, and *H. malayensis* from Kuala Lumpur, are described as new.

RICARDO (Gertrude). **Notes on a Collection of Species of Tabanidae from Hong Kong.**—*Bull. Entom. Research, London,* vi, no. 4, February 1916, pp. 405–407.

The blood-sucking TABANIDAE recorded in this paper include:—*Tabanus rubidus,* Wied.; *T. albimedius,* Walk.; *T. mandarinus,* Schiner; *T. sanguineus,* Walk.; *T. macfarlanei,* sp. n.; *T. hongkongiensis,* sp. n.; *T. indianus,* Ric.; *T. crassus,* Wlk.; *T. ditaeniatus,* Macq.; *T. flavothorax,* Ric.; *T. hybridus,* Wied.; *T. hilaris,* Wlk.; *T. jucundus,* Wlk.; *Chrysops dispar,* F.; *C. mlokosiewiczi,* Big.

TOWNSEND (C. H. T.). **Recent Questioning of the Transmission of Verruga by *Phlebotomus.***—*Bull. Entom. Research, London,* vi, no. 4, February 1916, pp. 409–411.

The power of *Phlebotomus verrucarum,* Towns., to transmit verruga has recently been questioned by Strong and other investigators. It is stated by these observers that the infection may be transmitted in a similar manner to that of small-pox. The fact that hundreds of verruga cases in all stages of eruption are treated in an open ward without one new case arising contradicts this. Contrary to the supposition of the same investigators, *Bartonella* does not appear to be closely related to the distinctively tick-borne Protozoa. The mosquito, *Phalangomyia debilis,* D. and K., does not occur in the verruga zone, but is confined to the higher region above the centres of infection, and there is therefore no possibility of this insect being a carrier of the disease as is suggested. The carrier of verruga must necessarily be a nocturnal or crepuscular bloodsucker which is abundant in individuals during the humid season, or period of greatest prevalence of the disease, and never absent at any time of year. It can be stated absolutely that *Phlebotomus* is the only species which meets these requirements, coupled with the fact that it is confined to the verruga zone.

Connal (A.) & Coghill (H. S.). **Annual Report of the Medical Research Institute of Nigeria for 1914.** *London*, 1916, 22 pp. [Received 16th February 1916.]

Yellow fever investigations were carried on throughout the year. The disease was transmitted to guineapigs by means of direct subcutaneous or intraperitoneal injection of blood from human cases. The infection was kept up through a series of guineapigs by the same method of inoculation. *Paraplasma flavigenum* was constantly found in the blood of the infected animals. Two monkeys were inoculated from infected guineapigs. *P. flavigenum* was found in the blood for a short time after the injection and a portion of the spleen showed "blue bodies" also. Observations on the feeding habits of *Stegomyia fasciata* showed that the female feeds either during the day or night, and after feeding for two or three successive days may remain one or two days without feeding. Examination of native children in the town of Abeokuta showed that 12 out of 35 possessed intra-corpuscular bodies similar to *P. flavigenum* and 18 were infected with malaria. Out of 65 guineapigs examined in the same town, 18 showed *Paraplasma*-like bodies.

Stegomyia fasciata, Culiciomyia nebulosa, Ochlerotatus irritans, O. nigricephalus and *Anopheles costalis* were used in feeding experiments in an attempt to find the insect host of monkey malaria. No developmental forms were however found in the mosquitos, nor did clean monkeys become infected. Blood smears from three cases of human trypanosomiasis showed the presence of trypanosomes of the *gambiense* type. *T. pecorum* was found in the blood of pigs from various districts. Seven out of 22 dogs examined proved to be infected with a trypanosome of the *brucei* type.

The following is a list of bloodsucking Diptera collected in Lagos and other districts :—*Anopheles costalis, A. umbrosus, A. mauritianus, Culex consimilis, C. invidiosus, C. duttoni, C. univittatus, C. guiarti, C. decens, C. thalassius, C. salisburiensis, C. insignis, C. tigripes, C. fatigans, C. rima, C. quasigelidus, C. grahami, C. albovirgatus, C. annulioris, Ochlerotatus nigricephalus, O. caliginosus, O. domesticus, O. ochraceus, O. irritans, O. punctothoracis, O. cumminsi, O. argenteopunctata, Stegomyia fasciata, S. luteocephala, S. africana, S. sugens, S. simpsoni, Culiciomyia nebulosa, Uranotaenia annulata, U. bilineata* var. *fraseri, Taeniorhynchus metallicus, T. aurites, T. annettii, Mansonioides africanus, M. uniformis, Banksinella punctocostalis, Glossina palpalis, G. caliginea, Hippocentrum versicolor, Chrysops longicornis, Tabanus secedens, T. obscurehirtus, T. socialis, T. besti, T. fasciatus, Haematopota pertinens, H. lacessens, H. gracilis, H. vittatus, H. puniens, T. albipalpus, T. billingtoni* and *T. socialis*. Specimens of the flea, *Xenopsylla cheopis*, were found on rats caught in Lagos and the following ticks were obtained :—*Amblyomma variegatum, Hyalomma aegyptium, Margaropus* (*Boophilus*) *annulatus* and *Haemaphysalis leachi.*

Strickland (C.). **Certain Observations in the Epidemiology of Malarial Fever in the Malay Peninsula.**—*Agric. Bull., Fed. Malay States, Kuala Lumpur*, iv, no. 3, December 1915, pp. 62–68.

Observations on the occurrence of malaria in the Malay Peninsula have led the author to put forward the following hypothesis :—Opened-up land in the hills and mountains is malarious because the ravines and valleys have been cleared of jungle, and these places are not malarious if the jungle over them has not been cut down. This theory is based on (1) the actual incidence of the disease among people living near jungle-covered ravines, and (2) evidence afforded by the mosquitos. Malaria is unknown among the Tamil coolies living along the Kuantan Road in Pahang. The line is surrounded on all sides by forest and is close to two streams, both covered in by jungle. On the other hand, fever was prevalent among coolies on an estate near Gambang, on the same road. In Kuala Lipis the European community live in quarters at the head of ravines which are closely overgrown with jungle; the district is considered so free from malaria that mosquito curtains are seldom used.

Carriers of malaria are absent from the forest-clad ravine swamps. *Anopheles umbrosus*, causing malaria on the flat land, does not breed in the hilly jungle, nor does *A. maculatus* breed in a similar situation. *A. aitkeni* is the only common species and has never been found inside houses, nor is it known to bite man. In human habitations near the jungle no Anophelines are found except those which breed in collections of water from round which the jungle has been cleared. In cuttings made in the jungle, *A. sinensis*, *A. albirostris*, *A. maculatus*, *A. karwari*, *A. fuliginosus*, *A. rossi* and *A. kochi* are commonly found.

The author believes that this hypothesis provides a working basis for the prevention of malaria in the hill-land. The remedy lies in not clearing the ravines within a line several feet outside the bounding hill contour when opening-up hill-land, or, if the ravines have been already cleared, in allowing the forest to grow up again. Assuming this hypothesis to be correct, it would appear that while on the alluvial coast-belt malaria is present in districts close to undrained jungle, in the hills the opposite is the case. This means that *A. umbrosus*, causing malaria on flat coast land, will not breed in the hills and that *A. maculatus*, which causes fever in the hills, will not breed on the coast alluvium. An intervening area is present in which the ranges of the two species overlap to a certain extent.

Rodhain (J.). **Note sur les Trypanoses et les Piroplasmoses des grands animaux de l'Ouellé.** [Note on the Trypanosomiasis and Piroplasmosis of the larger mammals of Welle.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 2, 9th February 1916, pp. 95–109, 1 fig., 1 table.

The trypanosomes and malarial parasites affecting man in tropical Africa have their homologues in the trypanosomes and piroplasmoses of wild and domestic animals. The question of the part played by animals as reservoirs of trypanosomes pathogenic to man is therefore of the highest importance. Of 89 head of cattle examined, 13 were infected with *T. congolense* (=*dimorphon*) and *T. cazalboui*; of 9 sheep, one only was attacked by *T. congolense*; 9 horses and 21 goats gave negative results. *T. congolense* is transmitted by *Glossina*, while *T. cazalboui* can be disseminated by species of *Stomoxys*, of which *S. calcitrans* is distributed throughout the Welle district. Among the big game examined, no cases of infection were found, except in one example of the duiker, *Cephalophus dorsalis*, in the blood of which *T. ingens* was detected. Specimens of *Glossina* were rare in the localities in which the game were examined.

Glossina palpalis, *G. morsitans* and *G. fusca* are met with in the Welle district. From dissections of specimens of *G. fusca* and by comparing the position of the trypanosomes in this species and in *G. palpalis*, *G. morsitans*, *G. brevipalpis*, etc., it may be assumed that *G. fusca* transmits trypanosomes of the types *cazalboui*, *congolense* and *pecaudi*.

Various forms of piroplasmosis occur in cattle, sheep, dogs and antelopes. In cattle the two types found were *Piroplasma bigeminum* and *Theileria mutans*. All the cattle in Welle have come originally from Lado or Aru, to the east and it is probable that the infection is endemic in these districts. The piroplasma of sheep, *T. ovis*, approaches *T. mutans* in its morphological characters. When inoculated into the blood of young animals, slight infections are produced which are followed by immunity. The parasites can persist in the blood of the host for long periods without affecting the general health, but in some cases may produce fatal results in a short time. Further researches with previously uninfected animals are necessary in order to determine the action of *Ixodes* in the propagation of the disease. Among the antelopes examined, two specimens of *Cobus defassa* showed parasites similar to *T. mutans*. A dog was found to be infected with *Piroplasma canis*.

The following blood-sucking Diptera were collected by the author:—*Stomoxys calcitrans*; *Lyperosia minuta* and *L. punctigera*, feeding on *Rhinoceros simus*, *Bubalis lelwel jacksoni* and *Cobus defassa*; *Glossina palpalis*, *G. morsitans*, *G. fusca*; *Chrysops silacea*, *C. distinctipennis*, *C. funebris*, *Tabanus socius*, *T. secedens*, *T. ruficrus*, *T. biguttatus* and species of *Haematopota* (*Chrysozona*).

HIRST (S.). **On the "Harvest Bug" (*Microtrombidium autumnalis*, Shaw).**—*Jl. Econ. Biol., London*, x, no. 4, December 1915, pp. 73–77, 2 figs. [Received 28th February 1916.]

Specimens of *Microtrombidium autumnale*, Shaw, (harvest bug) were obtained by the author in the Isle of Wight during September 1915. This mite is very troublesome in the district and occurs chiefly on the high chalk downs in the neighbourhood. Residents are believed to become immune to attack after long sojourn in affected districts. A description of the larval form is given. In France, in addition to *M. autumnale*, *Metathrombidium poriceps*, Oud., and *Trombidium striaticeps*, Oud., have been recorded as attacking man.

HIRST (S.). **On the Tsutsugamushi (*Microtrombidium akamushi*, Brumpt), Carrier of Japanese River Fever.**—*Jl. Econ. Biol., London*, x, no. 4, December 1915, pp. 79–82, 2 figs. [Received 28th February 1916.]

The larval forms of TROMBIDIIDAE occurring in Japan are capable of transmitting Kedani or River Fever. In this paper a description is given of the larval form of *Microtrombidium akamushi*, Brumpt, taken from the ears of field mice. At least four other species of the genus *Microtrombidium* are known from their larval forms in Japan.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.
Anopheles punctipennis transmitting Malaria in Louisiana 53
Experiments in the Control of *Trombidium holosericeum* in the U.S.A. 53
Naphthaline and Camphor against Lice 53
Adhesive for trapping Flies 53
A Key to the Larvae of Malayan Anophelines 54
The House-fly as a natural Carrier of Helminthic Ova in East Africa 54
Malaria and Mosquitos in the Federated Malay States 54
Notes on Ticks of the Genus *Ixodes* 55
New Blood-sucking Chironomids from Illinois 55
The Protection of Horses from Bot-flies in Queensland 56
Glossina and Sleeping Sickness in the Welle district of the Belgian Congo 56
Phlebotomus Fever in the Eastern Mediterranean 57
The Temperature necessary for the Destruction of Lice and their Eggs 57
The Dog as a Carrier of Parasites and Disease in the U.S.A. .. 58
The Transmission of Anthrax by *Stomoxys calcitrans* 58
A Disease of Dogs caused by *Rangelia vitalii* in Brazil 59
Malaria and Mosquitos on Ships in Mexico 59
The Possibility of the Introduction of Yellow Fever into Australia 59
Phlebotomus Fever in Syracuse 60
The Effect of Pyrethrum on Mosquitos 61
Protective Fluids against Mosquitos 61
Rats and Plague in Shanghai 61
Notes on the Breeding Places of *Anopheles punctipennis* in North Carolina 61
Experiments with Fowl Plague and *Argas persicus* in Italy .. 62
The preoviposition Period of *Musca domestica* in the U.S.A. .. 62
The Use of Carbon Bisulphide against *Gastrophilus equi* 62
A New Blood Parasite in *Rhipicephalus sanguineus* in Tunis .. 63
The Insect Vector of "Uta" in Peru 63
The Life-History of *Gongylonema scutatum* in the U.S.A. 63
The Stage of *Piroplasma bigeminum* in *Margaropus annulatus* .. 64
Ticks of the Belgian Congo and the Diseases they convey 64
New Tropical Mosquitos 64
Chalcidoid Parasites of *Glossina morsitans* in Nyasaland 65
Two new Species of *Haematopota* from the Federated Malay States 65
Notes on TABANIDAE from Hong Hong 65
The Transmission of Verruga by *Phlebotomus* in Peru 65
Mosquitos and Tabanids of Nigeria 66
The Epidemiology of Malarial Fever in the Malay Peninsula .. 66
Trypanosomiasis and Piroplasmosis in the Welle District, Belgian Congo 67
Notes on *Microtrombidium autumnale* in England 68
Microtrombidium akamushi and Kedani Fever in Japan 68

VOL. IV. Ser. B. Part 5.—pp. 69-84. MAY, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., ***Chairman.***

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.

Mr. Guy A. K. Marshall.

Assistant Director.	Assistant Editor.
Mr. S. A. Neave.	Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—27, Elvaston Place, London, S.W.

CLARE (H. L.). **Report of the Surgeon-General for the year 1914-15.** —*Trinidad and Tobago Council Paper no. 154 of 1915, Port-of-Spain*, 1915, 153 pp. [Received 28th February 1916.]

Anti-malarial measures were carried out in several districts during the year. As a result, the breeding grounds of *Anopheles* were restricted to a few parts which offered special difficulties in the way of efficient drainage. Measures against *Stegomyia* and *Culex* included the survey of four localities, one being the Dry River, the remaining three in the immediate neighbourhood of Port-of-Spain. In Queen's Park Savannah, the larvae of *C. fatigans* and *Stegomyia* were found in hollows in the trunks and roots of trees. In the Botanic Gardens, St. Anne's, the most fertile breeding places were found in holes in trees and in bamboo joints; the larvae present were those of *Stegomyia fasciata* (*calopus*), *Megarhinus trinidadensis*, *Limatus durhami* and *Sabethoides nitidus*. The Dry River showed a scarcity of larvae, owing to the presence of larvivorous fish and the swiftness of the current in certain parts.

Memoria presentada al Congreso de la Nación por el Ministro de Agricultura Dr. Horacio Calderón—1913. [Report presented to the Congress of the Nation by the Minister of Agriculture, Dr. Horacio Calderón, 1913.]—*Buenos Aires*, 1915, 531 pp. [Received 28th February 1916.]

In the part of this report which deals with live-stock, it is stated that piroplasmosis caused some losses during the year owing to a considerable transit of cattle from the north to the south. As a result of this traffic in cattle, some ticks (*Margaropus annulatus* ?) were carried to several estates in the provinces of Buenos Aires and Santa Fé, and tick infestation there was found to be due not only to imported individuals, but to a second and third generation born on the spot. During the year, 1,013,823 head of cattle were dipped in the official dipping tanks. Trials with trypan-blue showed that it possessed a real curative value against piroplasmosis. Attention is called to the necessity of co-operation for the erection of dipping tanks and the regular practice of dipping. A special board was entrusted with the drawing up of a plan of operations based on the most recent knowledge of the biology of the tick.

RAGAZZI (C.). **Intorno all' esistenza della febbre della costa in Cirenaica.** [Concerning the existence of coast fever in Cyrenaica.]—*Clinica Veterinaria, Milan*, xxxviii, nos. 2 & 3, 30th January & 15th February 1916, pp. 35–43 & 65–76.

This paper first gives a general review of African coast fever, due to *Theileria parva*, in various countries and deals with its occurrence in the Italian Colony of Libya. While Prof. Carpano believes this disease to be endemic there in a mild form among native cattle [see this *Review*, Ser. B, iv, p. 14], the author considers that no case of proved local origin has hitherto been found and that it may have been imported a first time without affecting native cattle. A second introduction may spread more widely among receptive animals. Strict inspection at the port of importation and a quarantine depot are therefore very necessary. A bibliography of nine works is given.

(C260) Wt.P1/106. 10. 5.16. B.&F.Ltd. Gp.11/3. ▲

Paoli (G.). **Ixodidi raccolti nella Somalia Italiana meridionale.** [Ixodidae collected in southern Italian Somaliland.]—Separate, dated 24th February 1916, from *Redia, Florence,* xi, no. 1, pp. 269–297, 5 figs., 1 plate.

Of 600 Ixodidae collected in southern Italian Somaliland in 1913, the most common species were *Rhipicephalus pulchellus,* Gerst., *Amblyomma lepidum,* Dön., *A. eburneum,* Gerst., and *Hyalomma aegyptium,* L. *Rhipicephalus appendiculatus,* Neum. and *R. simus,* Koch, were rare and no examples of *Margaropus* (*Boophilus*) *annulatus,* Say, *Amblyomma variegatum,* F., or *A. hebraeum,* Koch, were obtained. Other species obtained included :—Argasidae : *Argas persicus,* Ok., *Ornithodoros savignyi,* Aud., *O. moubata,* Murr. ; Ixodidae : *Rhipicephalus ecinctus,* Neum., *Amblyomma marmoreum,* Koch, *Aponomma exornatum,* Koch, *Haemaphysalis calcarata,* Neum., and *H. leachi,* Aud.

Rène (C.). **Le traitement de la gale du cheval.** [The treatment of mange in horses.]—*Progrès Agricole, Amiens,* xxx, no. 1465, 13th February 1916, p. 84.

For horses suspected of suffering from mange the following remedy is recommended : Titrated nicotin extract of State manufacture, 1 lb. ; commercial soda crystals, 1⅗ oz. ; water, 2 gals. This may be applied with a brush or a sponge, but, owing to the danger of poisoning, the whole surface of the body should not be treated at one time.

Sweet (Georgina). **Investigations into the Occurrence of Onchocerciasis in Cattle and associated Animals in Countries other than Australia.**—*Proc. R. Soc. Victoria, Melbourne,* xxviii (new series), no. 1, November 1915, pp. 2–51, 5 plates, 11 tables. [Received 11th March 1916.]

Investigations into the occurrence of worm-nodules, due to *Onchocerca,* in cattle and associated animals show that these nodules were present in the Malay Archipelago, Malay Peninsula, India, Ceylon, and Egypt. Allied parasitic worms have been found in the aorta of cattle and buffalo in Java, Sumatra, Malay States and India. *O. gutturosa* is characteristic of northern Africa, presumably in *Bos taurus* ; *O. indica* occurs in *B. indicus* in India, and *O. gibsoni* in *B. indicus* in the Malay Peninsula. The distribution of nodule-forming worms is probably much wider than is at present suspected. The original host is probably *Bos gaurus,* the Indo-Malayan gaur or wild ox.

Froggatt (J. L.). **Dips and Dressings used for protecting Sheep from Blow-flies.**—*Agric. Gaz. of New South Wales,* xxvii, no. 1, January 1916, pp. 17–28. [Received 6th March 1916.]

Dressings for this purpose may be either liquids, powders or pastes. The composition of the liquids is very variable, as also their preparation for use. Experience at the Experiment Station tends to show that all dips supplied ready for use mat the wool together and deleteriously affect the fibre. Many powders to be applied direct by dusting are said to be of no practical value under Australian conditions and they contain nothing of the nature of a healing agent where the skin is broken. The object of these various dressings is either to keep the flies away or to kill the maggots as soon as they hatch out. The analysis of liquid dips shows that the active principle relied upon by a number of manufacturers is some mixture of the phenols and cresols (carbolic acid and closely allied chemical substances), pyridine and its bases (generally present in small amount), and resin or resinates. There are nearly always two or more of these present in any one mixture. In several dressings which, according to the manufacturers, will prevent fly-blow, eucalyptus oil is a general constituent. In a few cases arsenic, copper sulphate (bluestone), turpentine, naphthaline, and iodoform are found to be present.

In the powders intended to keep the flies away from the sheep, iodoform seems to be the most popular active principle. In those intended to assist healing of the affected part in addition to preventing fly-blow, arsenic or some compound of arsenic and free sulphur are present. Pyrethrum powder is met with in several of the powder dressings.

In the analyses of the paste dressings, there is a great diversity in the active principles. Arsenious sulphide, free sulphur, cresols, and pyridine and its derivatives are the principal substances. The nature of these various compounds is briefly discussed, and it is remarked that mixtures containing resin or turpentine are extremely deadly to maggots, but their effect on the flies would seem to be neutral. On the wool, resin gives rise to thick, hard masses of matted fibre, which are often found to be the spots in which maggots shelter. Copper sulphate is satisfactory in regard to fly-blow, in that it dries up the wool, preventing any recurrence of the odour set up during the previous maggot infestation. It is however liable to act too drastically, in that it hardens and may crack the skin if the solution used is too strong, and it always deleteriously affects the wool-fibre. Iodoform exercises at the best but a very slight deterrent influence on flies, although it shows some effect on the maggots. The results obtained by experimenting with eucalyptus oil are variable. At times, it has a deterrent effect on *Pollenia stygia* (*Calliphora villosa*) and *Anastellorhina augur* (*Calliphora oceaniae*) for a short time, whereas as regards *Lucilia sericata*, *Calliphora rufifacies*, and *Pycnosoma* (*C.*) *varipes*, it is, if anything, an attraction rather than a deterrent. Sulphur is said by many sheep-owners to be efficient in helping to ward off the attacks of the sheep-flies at certain times, though the nature of its action is rather uncertain.

The value of dips as regards their action on the maggots has been studied systematically ever since the Experiment Station was founded, and the following observations have been made. Maggots, under the action of poisonous or other substances which are foreign to them, seem to have the power of throwing off a slimy secretion, and if they can get away into clean earth or other material before the poison acts, they get rid of it by shedding or rubbing off this coating. Many hundreds of maggots are found daily on the dip-saturated ground near the pens and from these over 90 per cent. of flies have been bred out regularly; it is thus clear that a very large number of maggots escape. To prevent this, there should be no dry earth in or near the pens and all maggots on the ground should be collected and destroyed. Various dips at the usual strength were tested by immersing maggots in them until apparently dead or for a period not exceeding one hour; in the former case the maggots were taken out of the dip and placed in moist earth and left for 24 hours and the mortality tabulated. Very few dips killed in less than 20 minutes and not more than 50 per cent. of the maggots were killed by the various dips tried after one hour's immersion. Many crawled out of the powders after 24 hours contact, alive and healthy; the addition of water in some cases caused a higher mortality, in others no difference was observable. When the maggots crawled out of the liquid and reached clean earth, they nearly always gave rise to flies; when they crawled out of the wool after dipping, the effect was nil so far as killing the maggots was concerned. The net result of the observations is to show that though dips drive out the maggots, they do not help appreciably to eradicate the flies.

Any dip must fulfil certain conditions, if it is to be of any real value in dealing effectively with the fly pest, and yet not have any ill effect on the wool. No dressing seems to have been discovered which will prevent subsequent fly-blow; the maggots are driven out and the attacked part healed, but the odour seems still to remain and attracts flies to the same place again. The effect on the wool is often bad; it rots and can be pulled away in lumps, in other cases it mats and forms masses with soft centres which shelter maggots. The effect of many dips on the animals themselves, especially if badly blown and sore, is also far from good. Some dips, particularly coal tar preparations and copper sulphate, will not come out properly in the scouring and their effects on the dyeing quality also require study. Dips are sometimes good at one time and bad at another for reasons which are not very apparent. They may be connected with another fly being the cause of a second attack, the difference of climatic conditions or lack of standardisation of the dips. The growth of the wool on a merino sheep is about a quarter of an inch per month and this keeps the dip further and further away from the skin. The methods of application are discussed, and of these, swabbing and rubbing, if thoroughly done, seems to be the most effective.

HILL (G. F.). **Report of the Government Entomologist to the Administrator of the Northern Territory of Australia for the eighteen months ended 30th June 1915**, pp. 43–46 of Administrator's Report for the year 1914–15 [*sine loco*], 1915. [Received 9th March 1916.]

Ochlerotatus (*Culicelsa*) *vigilax* appeared in 1914 in the Botanic Gardens in Darwin and adjacent mangrove swamps about 10th January. Thence this mosquito spread to the town; it increased in numbers until 30th January and then gradually decreased. At the end of November it was again found in the town, increasing in numbers until the end of January, and then slowly disappearing. This species enters houses after dusk, and remains hidden there until the following morning. Breeding takes place in pools of salt water in the low-lying districts to the north and north-east of the town; any reduction in the numbers can therefore only be obtained by drainage of these areas. *Culex fatigans* was less abundant than in former years. The prevalence of *Stegomyia fasciata* in Darwin, especially during the latter part of the dry season, was very marked. This species was probably responsible for the epidemic of dengue fever during the past season. Breeding places of *Anopheles* (*Nyssorhynchus*) *annulipes* were found in accumulations of stagnant salt and brackish water. Some were treated with larvicides, others were stocked with water-bugs of the family NOTONECTIDAE, which are predaceous on the larvae of this mosquito and of *Culex sitiens*. *Musca domestica* was comparatively scarce, except in a few localities. Ants are said to be an important factor in its control.

The report of the Chief Officer of Health contains an account of the measures carried out with regard to mosquito reduction. These consisted mainly of attempts to prevent breeding in water receptacles in the town, but on the whole little advance was made owing to lack of support on the part of the inhabitants.

Proclamation by the Governor-General of the Commonwealth of Australia.—*Commonwealth of Australia Gaz., Melbourne*, no. 159, 23rd December 1915. [Received 13th March 1916.]

This proclamation modifies and consolidates those of previous years which relate to the importation into Australia of certain animals and plants. In these provisions it is enacted that, in order to prevent the introduction of *Hypoderma bovis*, no cattle shall be imported into Australia from Great Britain and Ireland, the United States of America, or Canada, except those shipped between October and May.

Dipping Cattle.—*Rhodesia Agric. Jl., Salisbury*, xiii, no. 1, February 1916, p. 107, 1 plate.

The dipping tank described in this letter is built of cement and is provided with an inwardly projecting ledge which extends for some distance from the point of entry. This prevents a large waste of dip as the animals enter. Farmers are advised to mix 10 lb. bitter aloes with the dipping fluid when putting cattle through a new tank.

SINCLAIR (J. M.). **Veterinary Report.**—*Rhodesia Agric. Jl., Salisbury*, xiii, no. 1, February 1916, pp. 113–115.

During November 1915, new outbreaks of African coast fever occurred in the Melsetter district. A further outbreak occurred in the next month. The cattle were successfully removed to clean areas through a temperature camp and were dipped every three days. Good results have already been obtained. At the time of drawing up this report 69 tanks were in working order, and several were in course of construction.

North Borneo Medical Report.—*Indian Med. Gaz., Calcutta*, li, no. 2, February 1916, pp. 64–65.

Extracts are given from the Medical Report of Dr. W. B. Orme, P.M.O., of the State of North Borneo, including Dr. Roper's key to the local malaria-carrying mosquitos, viz:—A. With unspotted wings—*Anopheles brevipalpus*, sp. n. B. With spotted wings: (1) with banded palps—*A. kochi*, *A. maculatus*, *A. leucosphyrus*, *A. punctulatus*, *A. ludlowi*. (2) With tips of palps grey—*A. separatus*. (3) With palps unbanded—*A. barbirostris*, *A. umbrosus*, *A. albotaeniatus*.

Christophers (Major S. R.). **A Revision of the Nomenclature of Indian Anophelini.**—*Ind. Jl. Med. Research, Calcutta*, iii, no. 3, January 1916, pp. 454–488. [Received 20th March 1916.]

A list of valid species and varieties of Indian Anophelines is given with their synonyms and a key to the Indian species. The relation to malaria of 24 out of the 38 species mentioned is discussed. The following are recorded as carriers either experimentally or in nature :—*A. barbirostris, A. culicifacies, A. fuliginosus, A. funestus* var. *listoni, A. ludlowi, A. maculatus, A. maculipalpis, A. minimus, A. rossi* (though the position of the varieties of this species is doubtful), *A. stephensi, A. theobaldi, A. turkhudi* and *A. willmori*. A lengthy bibliography is appended.

Christophers (Major S. R.). **An Indian Tree-Hole breeding Anopheles,** *A. barianensis*, **James,** = *A.* (*Coelodiazesis*) *plumbeus*, **Haliday.**—*Ind. Jl. Med. Research, Calcutta*, iii, no. 3, January 1916, pp. 489–496, 1 plate. [Received 20th March 1916.]

Anopheles plumbeus (*barianensis*) has been recorded from several localities in the Western Himalayas at heights varying from 6,000 to 8,000 feet. Larvae were collected at Simla from water contained in the hollows of trees, generally oaks. The water was usually dark brown in colour. Larvae in the laboratory fed readily on fragments of crushed insects. Adults were found during the day resting inside hollow trees. Most of the females captured contained blood in the gut ; as they were found to enter houses in the morning and evening, it is probable that most of the blood was of human origin. Adults kept in captivity fed and oviposited freely, while larvae reared from the eggs gave rise to adults about four weeks later. *A. plumbeus* was numerous in the area investigated, but so far as was known, no cases of indigenous malaria were contracted at Simla. A description of the developmental stages is given.

Prashad (B.). **Male Generative organs of some Indian Mosquitos.**—*Ind. Jl. Med. Research, Calcutta*, iii, no. 3, January 1916, pp. 497–502, 2 plates. [Received 20th March 1916.]

This paper gives an account of the male genitalia of *Anopheles willmori*, James, *Culex fatigans*, Wied., *Stegomyia scutellaris*, Walk., *Ochlerotatus pseudotaeniatus*, Giles, and *Theobaldia spathipalpis*, Rond.

Awati (P. R.). **Studies in Flies.—ii. Contributions to the Study of Specific Differences in the Genus** *Musca*.—*Ind. Jl. Med. Research, Calcutta*, iii, no. 3, January 1916, pp. 510–529, 20 plates, 1 table. [Received 20th March 1916.]

This paper gives an account of the morphology of the genitalia in Calyptrate flies, and discusses the homologies of the segments and their appendages in the male. The genitalia in the genus *Musca* are dealt with in detail.

Mitter (J. L.). **The Life-History of** *Haematobia sanguisugens*, **Austen.** —*Ind. Jl. Med. Research, Calcutta*, iii, no. 3, January 1916, pp. 530–537, 1 plate. [Received 20th March 1916.]

The following observations on the life-history of *Haematobia sanguisugens*, Aust., an Indian blood-sucking Muscid, were made at Kasauli. Under natural conditions, eggs are deposited in fresh cattle-dung. Gravid females, when introduced into breeding jars, deposited eggs in fresh cow-dung in from 10 minutes to a few hours, from 2 to 12 eggs being placed in one spot. At a temperature of about 75° F. larvae hatched out in from 12 to 15 hours, and at 68° F. in from 20 to 24 hours. Feeding began immediately after hatching and the larvae were reared successfully when the dung was kept moist and free from moulds. The length of the larval stage was six or seven days at 75° F. and eight or nine days at 68° F. The pupal period lasted from five to six days or from seven to eight days at the same temperatures. The adults began to feed in five or six days after hatching. Both sexes are blood-sucking and feed at all hours during the day. They have been found attached to the neck, shoulders, and abdomen of cattle, and resting on weeds, shrubs, etc., near cattle sheds, or in fields where cattle were grazing. They were not found on animals in the city or inside cattle sheds, stables, or human dwellings, even when surrounded by shrubs and grasses. Horses, mules, and man were also attacked. At Kasauli, adults are present from April to November. Breeding occurs from June to October, and is at its height in August and September. There is a marked preponderance of females.

Mitter (J. L.). **The Life-History of** *Bdellolarynx sanguinolentus*, **Austen.**—*Ind. Jl. Med. Research, Calcutta*, iii, no. 3, January 1916, pp. 538–540. [Received 20th March 1916.]

The breeding habits of *Bdellolarynx sanguinolentus*, Aust., resemble those of *Haematobia sanguisugens*. The eggs, from 25 to 35 in number, are laid singly on the surface of fresh cattle dung. The larvae hatch out in 11 or 12 hours at a temperature of 71° F.; the maximum size is reached on the fourth day, and pupation occurs on the eighth day. The pupal period lasts seven days, at a temperature of from 68° to 70° F.

Liston (Major W. G.). **Report of the Bombay Bacteriological Laboratory for the year 1914.**—*Bombay: Govt. Central Press*, 1916, 14 pp.

A number of experiments were carried out to determine the best method of performing inoculation with anti-plague vaccine. The use of two small doses instead of one large dose conferred greater immunity. Observations on man showed that an initial dose of 1 or 2 cc., followed by double the first dose a week later, could be satisfactorily used. Further experiments with hydrocyanic acid gas for killing rats were carried out. The three species of *Xenopsylla* found on rats in Bombay, occur in the following proportions:—*X. cheopis*, 80·6 per cent.; *X. astia*, 18·5 per cent.; and *X. brasiliensis*, 0·84 per cent.

Creel (R. H.). **The Prevalence of Bubonic Plague and its Control.** —*Military Surgeon, Washington, D.C.*, xxxviii, no. 3, March 1916, pp. 269–280.

It is probable that the most potent factor that has operated towards preventing any serious plague epidemic in the Philippines has been the rat-proof construction of the native Filipino hut—elevated three or four feet, with the ground exposed and bare, bamboo floors and single walls—which affords but little harbour for rats. The relative freedom of Europe from plague, as compared with the epidemics of the middle ages, may likewise be ascribed to the use on that continent of rat-proof buildings of stone and solid masonry. Where plague is endemic, the country concerned has a non-rat-proof type of buildings.

Mitzmain (M. B.). ***Anopheles punctipennis*, Say; its relation to the transmission of malaria—Report of experimental data relative to subtertian malarial fever.**—*Public Health Reports, Washington, D.C.*, xxxi, no. 6, 11th February 1916, pp. 301–307.

The possible rôle played by *Anopheles punctipennis*, Say, in the United States in the transmission of subtertian malarial fevers is dealt with. The only record of previous work on this subject, which is that of Hirschberg in 1904, was not considered adequate to exclude this Anopheline definitely as a carrier. Two hundred and nineteen specimens of *A. punctipennis* were dissected from 3 to 38 days after multiple bites on individuals whose blood contained varying numbers of subtertian gametocytes. No infection was observed in the dissection of stomachs and salivary glands. Two healthy individuals were bitten 91 and 180 times by specimens of *A. punctipennis*, 4 to 33 days after sucking blood of a subtertian malaria carrier. In this experiment, and in another in which 22 additional mosquitos of the same species were fed on another healthy individual, *A. punctipennis* could not be incriminated in the transmission of subtertian malaria. Control feedings with 74 specimens of *A. quadrimaculatus*, Say, resulted in an infection of 13·8 per cent., and with three specimens of *A. crucians*, Wied., of 33·3 per cent. In one case an individual developed subtertian malaria 11 days after the single bite of an example of *A. quadrimaculatus* which had become infected (as shown by dissection) 17 days previously.

Michie (H. C.) & Parsons (H. H.) **Rocky Mountain Spotted (Tick) Fever: Report of an Investigation in the Bitter Root Valley of Montana.**—*Medical Record, New York*, no. 2362, 12th February 1916, pp. 265–277.

This paper is a resumé of our knowledge of Rocky Mountain spotted fever, and includes the results of eighteen months' research on this disease, as it occurs in the Bitter Root Valley. It is stated that the tick conveying the disease (*Dermacentor*) is a slow feeder, requiring hours to become attached to an animal. Those exposed to the bites of this tick should search their person at least three times a day; if this were done, there would be very few cases of spotted fever. A bibliography of 43 works, referred to in the paper, is given.

FRICKS (L. D.). **Rocky Mountain Spotted Fever: A Report of Laboratory Investigations of the Virus.**—*Public Health Reports, Washington, D.C.*, xxxi, no. 9, 3rd March 1916, pp. 516-521.

Among the facts determined by various workers during 14 years of investigation are the following: Man, rhesus monkeys, and at least six varieties of small wild rodents found in the Rocky Mountain region are susceptible to infection, while the larger domestic animals are generally immune. Of laboratory animals, guinea-pigs and white rats are highly susceptible, while white mice are apparently immune. The virus is transmitted by the bite of infective wood ticks (*Dermacentor*) and no other biting Arachnid or insect has been found capable of transmitting it.

von EZDORF (R. H.). **Demonstrations of Malaria Control.**—*Public Health Reports, Washington, D.C.*, xxxi, no. 10, 10th March 1916, pp. 614–629, 4 figs.

The results of antimalarial measures undertaken at Roanoke Rapids, North Carolina, and Electric Mills, Missouri, are given in this paper. At Roanoke in 1913, *Anopheles quadrimaculatus* was breeding extensively and was readily found in houses; in 1914 very few were found, and in 1915 this species had disappeared, only a few *A. punctipennis* being present. The incidence of the disease was very greatly reduced in both localities.

Tsetse-Fly and Big Game in S. Rhodesia.—Correspondence from the British South Africa Company, received from the Colonial Office 17th March 1916.

In the area visited by the Government Entomologist in November and December 1914, between the Sengwa and Umniati Rivers, tsetse-fly (*Glossina morsitans*) appears to be extending its range. Although the game laws have been suspended in this region, there is no appreciable decrease in the numbers of game, except in the case of elephant. A case of trypanosomiasis was reported near the Sengwa River in November 1914 and in this connection the Medical Director found that the fly was spreading eastwards and recommended the destruction of antelopes. In a report from the Director of Agriculture, relating to the destruction of game in affected districts, the extermination of game in a clearly defined zone is considered feasible and likely to have the desired effect. It is suggested that the services of natives, armed in some cases, should be utilised for this purpose. The cost would be partly covered by the sale of the skins, etc., of the animals shot. Blood smears should be made from every animal killed. Estimates should be made of the numbers of game in each area shot over, and also of the distribution and quantity of the fly before and after the operation; this work should be controlled by the entomologist. It is proposed that this extermination should only take place in a belt situated on the north, south and east of the free shooting area of Mafungabusi, which is bounded on the west by an area in which sleeping sickness is known to exist. It is stated that the opening of certain areas to free shooting has had the effect of driving game from these areas into inhabited country and that the hunters have neglected other game to some extent in order to secure elephants. The need for further tsetse-fly investigations is urged.

COUTANT (A. F.). **The Habits, Life-History, and Structure of a Blood-sucking Muscid Larva** (*Protocalliphora azurea*).—Separate from *Jl. of Parasitology, Urbana, Ill.*, i, March 1915, pp. 135–150, 7 figs. [Received 17th March 1916.]

The larva of the Muscid, *Phormia* (*Protocalliphora*) *azurea*, is normally a blood-sucking parasite of nestling birds, causing fatal results in some cases. Specimens were found by the author in June 1914 on crows about five weeks old; others were found in the nest, and therefore were probably intermittent feeders. Attempts made to rear the larvae on fresh and putrifying meat, failed. Previous observations by Kirsch, Brauer, and others, have shown that these larvae may bore into living tissues. The larvae preferred rather dry places to moist ones, and do not appear to be adapted to living in decomposing or faecal matter. One of the crows examined contained malarial parasites in the blood, but the larvae are not thought to have played a part in the transmission of these. The length of life of the larva is probably between 14 and 20 days. Pupae kept in breeding cages transformed into adults in 10 days. Adults fed readily on milk and biscuits and were not attracted to meat, as is the case with other blow-flies. *P. azurea* has been recorded from France, Britain, Italy, Germany and New England, in each case in very small numbers, and seems to occur chiefly among birds which build in protected positions, such as stables, etc. A description of the different stages is given.

PARKER (R. R.). **New Evidence concerning the Dispersal of the House-Fly.**—*Bull. Dept. Public Health, Helena, Montana*, ix, nos. 7 & 8, November–15th December 1915, pp. 3–7. [Received 30th March 1916.]

During 1915 investigations into the dispersal of house-flies under city conditions were carried out. A total of 387,877 marked flies were released during a period of 35 days from four stations at various positions in the city. The flies were recaptured in varying numbers at different places, the most distant being about 1⅓ miles from any point of release. It was concluded that movements were mainly dependent on stimuli such as odours from feeding and breeding places.

The results suggest that the following points are of practical significance under city conditions in Montana:—(1) flies from a given breeding place may spread over an area within a city of at least five square miles; (2) flies do not remain close to breeding grounds, but often show considerable migration; (3) conditions within a city which are favourable to breeding are important to the residents and also to those living close to the city; (4) the importance of co-operation in control work is strongly emphasised.

Moore (W.). **Fumigation of Animals to destroy their external Parasites.**—*Jl. Econ. Entom., Concord,* ix, no. 1, February 1916, pp. 71–80, 2 figs.

During 1915 a number of essential oils were tested at the Minnesota Experiment Station in relation to their values as insect repellents. Most of the oils were found to injure plants and when placed on animals afforded only temporary relief. The benzene series of compounds was also tested. A rat placed in a fumigation box having a capacity of 180 cubic feet and the atmosphere saturated with nitrobenzene was active and feeding at the end of 24 hours ; after 36 hours, it was alive, but sluggish, and died at the end of 48 hours. The experiment was not conclusive, as the rat was forced to eat food saturated with nitrobenzene, and lack of oxygen may have affected the results. The effect of this compound on insect parasites was observed. Dog fleas were found to leave the host at the end of half an hour and to be quite dead at the end of 1½ hours, while the dog itself was uninjured. Pigs infested with lice required an exposure of from six to eight hours. A sheep with very close wool was freed from 90 per cent. of the ticks (*Melophagus ovinus*) on it after 12 hours ; those picked up from the floor of the fumigating box revived after 12 to 24 hours, while those left in the wool did not do so. This result is of especial value, as sheep in wool cannot be dipped successfully. The puparia were not killed by fumigation. Mites on chickens were destroyed in from eight to ten hours, and red mites in a chicken house were also killed. Texas cattle fever ticks (*Margaropus annulatus*), mostly engorged females ready to oviposit, were killed by an exposure for 10 hours. With one exception, none of the animals fumigated showed signs of injury. Cats were able to withstand an exposure of 1½ hours, but were killed in 10 or 12 hours. The author and another person remained in a small room fumigated with nitrobenzene for 1½ hours, during which time the house-flies were destroyed, while the only effect on the investigators was a slight irritation to the eyes and throat. In some later experiments the compound was allowed to evaporate from a cloth, since evaporation by heat gave a super-saturated atmosphere which was liable to produce poisonous effects. One drop at 83° F. saturated one cubic foot, while at 40° F., only one-tenth of a drop was present.

Paradichlorobenzene was found to be less poisonous than nitrobenzene ; dog-fleas were killed in 2½ hours, while sheep-ticks were apparently unaffected. Ortho-, meta-, and para-cresol were tested, but only orthocresol was able to kill fleas in 1½ hours, without injury to the animals. Carbolic acid crystals evaporated by heat produced similar results in 1½ hours, and salicylic aldehyde drove the fleas off the animal in five or ten minutes, but did not kill them for some hours.

Experiments on a large scale, such as the fumigation of barns, are necessary. The chief difficulty in Minnesota is the low temperature of barns in winter, whereby an insufficient quantity of nitrobenzene is held in the air to produce the required result.

Mally (C. W.). **The House-Fly.**—*Reprinted from the Farmers' Weekly, Bloemfontein*, 13th, 20th, & 27th October 1915, 9 pp. [Received 21st March 1916.]

In South Africa the adult stage of the house-fly (*Musca domestica*) is reached 11 days after oviposition. The total number of eggs deposited by a single female is about 500, and if conditions are favourable there are 12 generations annually.

The use of sodium arsenite as a means of control is given at some length [see this *Review*, Ser. B, iii, pp. 220–221]. In addition to the use of branches of *Acacia cyclopis* as a carrier for the sweetened solution, sawdust, oiled paper, sacking, canvas, straw, etc. may be utilised. Where carriers are not available, the bait should be sprinkled freely over the breeding places.

Hewitt (C. G.). **A Contribution to a Knowledge of Canadian Ticks.**—*Trans. R. Soc. Canada, Ottawa*, Ser. iii, ix, sect. 4, 1915, pp. 225–239, 3 plates, 1 map. [Received 27th March 1916.]

The following species of ticks are recorded :—

Argasidae : *Ornithodoros megnini*, Dugès, on jack rabbits at Lethbridge, Alta.; this is the first record north of Oregon and Idaho. Ixodidae : *Ixodes angustus*, Neum., on a mouse from New Brunswick, and on squirrels, *Lepus americanus*, and *Tamius townsendi*, in British Columbia ; *I. auritulus*, Neum., on *Cyanocitta stelleri carlottae* (Queen Charlotte jay) from British Columbia, and *Haliaëtus leucocephalus alascanus* (Alaska bald eagle) ; *I. hexagonus*, Leech, on a weasel in British Columbia ; *I. hexagonus*, var. *cookei*, Pack., on dog in Ontario ; *I. marxi*, Banks, on red squirrel and fox in Ontario ; *I. pratti*, Banks, on dog, cat and horse, at Milk River, Alta. ; *I. ricinus*, L., on man, dog, deer, *Lepus sylvaticus*, ground squirrel, etc., in various localities in British Columbia ; *I. texanus*, Banks, on *Procyon lotor* (racoon) and *Sciurus douglasii* in British Columbia ; *Haemaphysalis cinnabarina*, Koch, on cattle, *Pedioecetes phasianellus* (sharp-tailed grouse), *Tympanuchus americanus* (prairie hen), and turkey, in Manitoba and British Columbia ; *H. expositicius*, Koch, from Winnipeg ; *H. leporis-palustris*, Pack., on rabbits and ground-inhabiting birds, in Manitoba, Saskatchewan, and British Columbia ; *Amblyomma americanum*, L., from Manitoba ; *Dermacentor albipictus*, Pack., on moose, elk, horse, cattle, and deer, in British Columbia, Manitoba, Quebec and New Brunswick ; *D. variabilis*, Say, on dog, cattle, horses, and man, in Manitoba ; *D. venustus*, Banks, on man, horse, mountain sheep, cattle, rabbit, etc., from British Columbia and Manitoba.

The life-cycle of *I. angustus*, according to Hadwen's observations, occupies about seven months. Oviposition begins 16 days after maturity is reached, while larvae hatch on the 73rd day. Nymphs appear 61 days later. An account is also given of the life-histories of *Dermacentor variabilis*, *D. venustus* and *D. albipictus*.

MACFIE (J. W. S.). **Report of the Accra Laboratory for the Year 1914.** *London,* 1915, 56 pp., 3 charts, 4 plates, 20 tables. [Received 27th March 1916.]

A large part of this report has been published in other journals [see this *Review*, Ser. B, iv, pp. 27 and 42]. The following additional facts are recorded. The ticks, *Amblyomma marmoreum* and *Haemaphysalis leachi*, were taken on hedgehogs. Several cases of spirochaetosis occurred among poultry in Accra in December 1914; no ticks were found on affected birds, but *Echidnophaga gallinacea* was present in considerable numbers. Atoxyl appears to be valuable as a prophylactic. *Aponomma laeve* and *A. marmoreum* were found on snakes, and the latter also occurred on lizards. Some of the snakes, lizards, and toads examined showed the presence of Haemogregarines. During the year, 334 consignments of mosquito larvae from Accra and Christiansborg were received, and the following species identified :—*Stegomyia fasciata*, *Culex fatigans*, *C. decens*, *C. tigripes*, and *Anopheles costalis*. Naphthaline suspended above water was shown to have little value as a larvicide, but in the proportion of 1 to 2,856 killed adults emerging from the pupae within 24 hours. It would probably prevent adults from sheltering and ovipositing in wells and cisterns. Naphthaline is fairly soluble in kerosene and the solution might be used in some situations which cannot be effectively screened and where it is impossible or inadvisable to remove the water entirely. Under the temperature conditions prevailing at Accra, however, kerosene used alone in enclosed spaces was found to give off vapour sufficient to kill larvae and adults.

The following is a list of insects collected at Accra by the author :—Coleoptera. TENEBRIONIDAE : *Alphitobius* sp. from a swallow's nest. Diptera. CULICIDAE : *S. fasciata*, F. ; *C. fatigans*, Wied. ; *Ochlerotatus punctothoracis*, Theo. ; *O. irritans*, Theo. TABANIDAE : *Tabanus biguttatus croceus*, Surc. ; *T. ditaeniatus*, Macq. MUSCIDAE : *Glossina palpalis*, R. D. ; *Cordylobia anthropophaga*, Grunb., from a cat. Siphonaptera. PULICIDAE : *Xenopsylla aequisetosa*, End., from *Cricetomys gambianus* (giant pouched rat). Orthoptera. HEMIMERIDAE : *Hemimerus talpoides*, Walk., from *C. gambianus.*

JOBBINS-POMEROY (A. W.). **Notes on Five North American Buffalo Gnats of the Genus** *Simulium.—U. S. Dept. Agric., Washington, D.C.*, Bull. no. 329, 6th March 1916, 48 pp., 15 figs., 5 plates.

Buffalo gnats are present in considerable numbers in the Mississippi Valley and in many other portions of the Southern States. Adults in copula have been found flying near the stream from which they were emerging, while females are known to travel long distances in search of food. Adult females feed almost entirely on mammalian blood; they have also been recorded as attacking Lepidopterous larvae and pupae. *Simulium venustum* was found from early spring to late autumn in the ears of horses and mules, but seldom on man or cattle; the maximum numbers occurred near the beginning and end of this period. The method of oviposition of the various species differs according to the habitat. In South Carolina, two distinct groups can be recognised. The first, represented by *Simulium pictipes*, is restricted to rivers with rocky beds and containing such obstructions as partly submerged trees, etc. Eggs are deposited at or below the surface on smooth rocks, posts, or débris. The second group, containing *S. vittatum*, *S. venustum*, *S. johannseni* and *S. bracteum*, is found in small streams with less current and with submerged herbage on which eggs are deposited. The time of day at which oviposition occurs is from 4.30 p.m. until 5.30 p.m. or until dusk. The most suitable weather conditions are sunshine and lack of wind, while the maximum temperature at which egg-laying can take place is 95° F. The earliest record of oviposition at Dallas, Texas, was on 25th March, and the latest at Spartanburg, S. C., on 2nd November. About 500 eggs may be laid by a single female at one time. Experiments at Spartanburg have shown that eggs and young embryos are unable to hatch after undergoing desiccation. Outbreaks of *Simulium* in large rivers in early spring are due to the fact that desiccation is prevented by the rising of the water at this period. The eggs hatch either in still or running water, the period of incubation in the different species varying from 7 to 12 days. The young larvae require swiftly flowing water for their development. The sudden appearance of *Simulium* in new localities may be due to a change in distribution occasioned by an increase in the swiftness of the current by heavy rains. The length of the larval stage in summer is about 17 days. The food is entirely microscopic, the larvae apparently thriving best in streams containing *Euglena viridis* and *Spirogyra.* The streams in South Carolina which are contaminated by chemical refuse from cotton mills are entirely free from larvae ; this fact is of importance in carrying out control measures. Pure animal sewage is not deleterious to growth, provided other factors are favourable. The duration of the pupal stage at Mumford, N.Y., is three weeks ; at Havana, Ill., the maximum period in late autumn is nine days at a temperature of 36° F. The minimum period in the case of *S. venustum* at Spartanburg during June is 84 hours, at a temperature of from 70° to 90° F. The emergence of the adult is hastened up to 90° F. In the Southern States breeding is continuous from the middle of March until the end of November, the life-cycle occupying approximately four weeks. In South Carolina there are five or six generations annually, except in the case of *S. pictipes*, which normally has three generations. In Illinois, *S. venustum* has three or four generations each year.

The larvae are often parasitised by Nematode worms of the genus *Mermis* and by Myxosporidia. *Hydropsyche* sp. and Cyprinid fish prey upon this stage. The adults are parasitised by *Mermis* sp. and by the trypanosome, *Crithidia simuliae*, and are attacked by a wasp, probably *Monedula signata.* The supposition that species of *Simulium* are capable of transmitting virulent charbon, cholera among chickens and pigs, and pellagra, has been put forward by various observers. In an attempt to determine whether such a relation exists, investigations on the biting and feeding habits of *S. venustum* were carried out. The results were as follows :—(1) In all adults taken while ovipositing, apparently digested blood was present in the stomach ; (2) no eggs within the ovaries developed without engorgement and the requisite time to digest the blood meal ; (3) adults apparently fed again after oviposition ; (4) the males had reduced mouth-parts and were not engorged with blood, indicating the acquisition of this habit by the females for a special purpose.

A very complete bibliography is given.

FRIEDMANN (A.). **Beiträge zur Bekämpfung der Kleiderläuse in Kleidern.** [Contribution to the control of body lice in clothing.]—*Centralbl. für Bakt. Parasit. u. Infektionskr., Jena,* 1te. Abt. Originale lxxvii, pt. 4, pp. 320–338. [Received 24th March 1916.]

A brief summary is given of results obtained against lice by previous authors with moist and dry heat and various chemicals. The author's own observations show that the eggs develop best at 85–89° F. and 40–50 per cent. relative humidity. Exposure for five minutes to hot steam is fatal to them ; both lice and eggs were killed by exposure to a dry heat of 160° F. Lice and eggs on woollen material rolled up so as to completely fill a test tube and exposed to the same dry heat were all killed. Five advertised insect powders were tried, but none of them killed lice in 48 hours though brought into intimate contact with them. A considerable amount of evidence was obtained that lice avoid silk materials. When lice were exposed in flasks to the vapour of carbon bisulphide for 24 hours they all died, and attempts to hatch eggs similarly exposed failed ; lice and eggs rolled in various woven materials were also killed by this means. Clothing infested with lice was hung in a room 16 feet by 13 feet and 9 feet high and 7 litres of carbon bisulphide was placed in saucers in it and the room closed for 15 hours at a temperature of 70° F. Examination of the air of the room showed that it contained 425 parts of carbon bisulphide in 10,000. Two hours after opening the room all odour had disappeared, the lice were all killed and all attempts to hatch the eggs failed. Experiments with lice in infested clothing exposed to the vapours for 10–12 hours in well closed metal boxes were quite successful. Sulphurous anhydride was found effective at 31 grains per cubic foot of air even in clothing tied up in bundles. In laboratory experiments four hours exposure of lice-infested material in large glass flasks was successful at a lower percentage of gas, but apparently not less than 22 grains per cubic foot at 70° F. is required to ensure a good result.

SÁ (C.) & CUNHA (A.). **Estudos sobre a Tristeza.** [Studies on Piroplasmosis.]—*Rev. Veterinaria e Zootechnia, Rio de Janeiro,* v, no. 6, December 1915, pp. 288–303, 4 plates

This paper is a summary of the history and nomenclature of piroplasmosis and discusses immunisation methods. At Gamelleira (Brazil) the tick most commonly identified in this connection was *Margaropus annulatus* var. *microplus*, Canestrini. A list of 25 recent works on the subject is appended.

ALESSANDRINI (G.). **I pidocchi ed i mezzi per distruggerli.** [Lice and the means of destroying them.]—*Annali d'Igiene, Rome,* xxvi, no. 2, 29th February 1916, pp. 92–108, 3 figs.

This paper reviews the various methods of control that have been employed against *Pediculus capitis*, de G., and *P. humanus*, L. (*vestimenti*, de G.). A description of these species is given and their biology is discussed. One of the control measures referred to is that suggested by Dr. Muto, of the Italian army, who has reported successful results with 8–10 per cent. creolin evaporated in a tightly, if not hermetically, closed wooden receptacle. Clothing to be freed from lice is exposed to the fumes at a temperature of 104° Fahr. for 10–20 minutes.

Bouilliez (M.). **Contribution à l'étude et à la répartition de quelques Affections parasitaires au Moyen Chari (Afrique Centrale).** [Contribution to the study and distribution of certain parasitic affections in the Middle Shari.]—*Bull. Soc. Path. Exot., Paris,* ix, no. 3, March 1916, pp. 143–167, 1 map.

This paper continues a preliminary report [see this *Review*, Ser. B, iii, p. 29] on the distribution of sleeping sickness in the centre of French Equatorial Africa and contains information as to further foci of the disease. The movements of native traders and their people across the Kamerun frontier having been largely diverted in consequence of the war, it was often difficult to determine whether the cases seen were really indigenous or imported, and it is pointed out that this diversion of travel routes may possibly lead to the infection of *Glossina* in areas in which the flies are at present free from trypanosomes. Up to a very short time ago, *G. palpalis* had not been found in this area and it was only in September of 1915 that a few specimens were discovered on the banks of the Ko River, though no case of disease was seen in any of the neighbouring villages, while no *G. palpalis* was found in or near the villages on the neighbouring river Sara, in which sleeping sickness is rife. The disease is localised, though *G. morsitans* is abundant everywhere and *G. tachinoides* is almost as common, especially along the water courses; the author therefore thinks that these species may be eliminated as carriers. As a useful prophylactic measure, it is suggested that a pass should be issued to travellers, certifying, among other things, their freedom or otherwise from trypanosomes, date of examination, treatment, etc. Traffic should be restricted to certain routes on which there should be examination posts. Details are given of numerous inoculation experiments with various species of trypanosomes. Examination of the blood of geckos and of several species of lizards failed to yield any bodies having a possible relation to leishmaniasis. The malaria index of the area is as high as 80 per cent., but there is only one really common mosquito, viz:—*Anopheles* (*Myzomyia*) *funestus.*

Bouet (G.). **Existence d'un petit foyer de trypanosomiase humaine à la Basse Côte d'Ivoire.** [Existence of a small centre of human trypanosomiasis in the Lower Ivory Coast.]—*Bull. Soc. Path. Exot., Paris,* ix, no. 3, March 1916, pp. 168–186.

Investigations made in 1906–08 tended to show that sleeping sickness is not endemic in the lower Ivory Coast, but since that time several undoubtedly locally acquired cases have been recorded, the neighbourhood of Bingerville being regarded as a centre. Domestic animals which were examined failed to yield *Trypanosoma gambiense,* though *T. dimorphon* was found and *T. cazalboui* occurred in animals brought from the north; imported animals die from infection by *T. dimorphon.* Of 458 flies examined none was found infected with *T. gambiense,* though *T. dimorphon* was present in 3·7 per cent.; a single case of *Glossina* infected with *T. cazalboui* was discovered in 450 flies, probably contracted locally from an imported animal. In consequence of the general conditions and the humidity of the whole area, *G. palpalis* is not localised and the chance of the infection of this fly with *T. gambiense* is regarded as very small, though possible, and proper precautions should be taken to destroy its haunts near inhabited centres.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.

Measures against Mosquitos in Trinidad 69
Piroplasmosis of Cattle in Argentina 69
Piroplasmosis of Cattle in Libya 69
Ticks collected in Italian Somaliland 70
The Treatment of Mange in Horses 70
The Distribution of *Onchocerca* in Domestic Cattle 70
Dips and Dressings used for protecting Sheep from Blow Flies in Australia 70
Notes on Mosquitos of the Northern Territory of Australia .. 72
Legislation against the Introduction of *Hypoderma bovis* into Australia 73
Dipping Tanks against African Coast Fever in Rhodesia 73
A Key to the Malaria-carrying Anophelines of N. Borneo 73
Indian Anophelines and their Relation to Malaria 74
The Habits of *Anopheles plumbeus* in India 74
The Male Genitalia of some Indian Mosquitos 74
Specific Differences in the Genus *Musca* 74
The Bionomics of *Haematobia sanguisugens* in India 75
The Bionomics of *Bdellolarynx sanguinolentus* in India 75
Relative prevalence of *Xenopsylla* spp. on Rats in Bombay .. 75
The Importance of Rat-proof Buildings in controlling Plague .. 76
The Relation of *Anopheles punctipennis* to Malaria in the U.S.A. .. 76
Rocky Mountain Spotted Fever in Montana 76
Notes on Rocky Mountain Spotted Fever 77
The Results of Antimalarial Measures in the U.S.A. 77
Tsetse-Fly and Big Game in S. Rhodesia 77
The Habits and Distribution of *Phormia azurea* 78
The Dispersal of the House Fly in Towns in the U.S.A. 78
Experiments in Fumigation with Nitrobenzene in the U.S.A. .. 79
Notes on *Musca domestica* in South Africa 80
The Distribution of Ticks in Canada 80
Blood-sucking Insects from the Gold Coast 81
The Habits of *Simulium* in the U.S.A. 81
Experiments in the Control of Lice 83
Notes on Piroplasmosis in Brazil 83
Glossina and Sleeping Sickness in French Equatorial Africa .. 84
Glossina and Sleeping Sickness on the Ivory Coast 84

VOL. IV. Ser. B. Part 6.—pp. 85-100. JUNE, 1916.

Smithsonian Institution
JUL 30 1916
National Museum.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., *Chairman.*

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.
Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.
Dr. Guy A. K. Marshall.

Assistant Director.	Assistant Editor.
Mr. S. A. Neave.	Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—27, Elvaston Place, London, S.W.

thsonian Institution JUL National Museum

LAVERAN (A.). **Présentation de moustiquaires destinées spécialement aux troupes en campagne et aux voyageurs.** [An account of mosquito nets intended especially for troops on a campaign and for travellers.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 3, 8th March 1916, pp. 122–124, 2 plates.

This paper describes the mosquito nets adopted by the armies of the United States and Japan. The Japanese type, which the author considers the more effective, consists of a cylinder of net supported by two rings of steel, about 10 inches in diameter, which are kept apart by a spiral of the same metal. The upper part of the cylinder is closed; to the lower ring is attached a fold of cloth which can be placed closely round the neck when the net is worn. The net can be folded up when not in use.

d'ANFREVILLE (L.). **Les Moustiques de Salé, Maroc.** [The Mosquitos of Salé, Morocco.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 3, 8th March 1916, pp. 140–142, 6 figs.

The presence of *Stegomyia fasciata* in the coastal districts of Morocco has already been dealt with [see this *Review*, Ser. B, iv, p. 40]. Other species occurring from September to February are:—*Anopheles maculipennis*, *Culex annulatus* var. *marocanus*, var. n., and *C. fatigans*. *Anopheles* become very scarce from October onwards, but a small number are still found up to the beginning of January, which is the coolest period of the year. The disappearance of malaria coincides with that of the *Anopheles*. *A. maculipennis* appears in April and disappears in September. *C. annulatus* var. *marocanus*, which is seldom found indoors, is described. *C. fatigans* disappears in the very cool weather and reappears with a rise of temperature. It oviposits everywhere, especially in the cesspits of Arab houses.

MARCHOUX (E.). **Transmission de la Lèpre par les Mouches** (*Musca domestica*). [Transmission of leprosy by flies (*Musca domestica*).]—*Ann. Inst. Pasteur, Paris*, xxx, no. 2, February 1916, pp. 61–68.

The fact that house-flies are capable of transmitting leprosy has been recorded by several investigators and further observations on this subject were carried out by the author during 1913. In the preliminary experiments, flies which had been allowed to feed on a pulp obtained from the glands of strongly infected rats were enclosed together with wounded rats. The flies, upon dissection, showed the intestine to be filled with a reddish matter formed from the glandular pulp, and containing enormous numbers of bacilli. Examination of the rats after a considerable interval showed that infection had occurred only in the case in which septic material had been present throughout the experiment. Further experiments showed that failure to infect was due to the drying up and consequent death of the bacilli on the feet and proboscis of the flies; infection only occurred when these parts had been recently soiled. When bacilli from the intestine were introduced beneath the skin of rats, infection followed in all cases. Female flies were found to absorb more septic material than males, and the same material remained alive for a longer period in the intestine

(C269) Wt.P1/106. 1,500. 6.16. B.&F.Ltd. Gp.11/3.

of the female. The bacilli could live in the digestive tract for at least four days, and it is therefore considered probable that infection can take place by the deposition of fresh excrement on wounds. This deposition occurs less commonly than is usually believed, since flies removed from septic material for 24 hours do not cause infection.

LANE (Lieut.-Col. D. T.). **Report on Malaria in the Punjab during the Year 1914, together with an Account of the Work of the Punjab Malaria Bureau.**—*Lahore*, 1915: Printed by the Superintendent Govt. Printing, Punjab, 3 pp., 3 maps, 3 charts. Price Rs. 1–5–0 or 2*s*.

Three maps, three charts and a mortality table illustrate this report. From a summary of the malaria survey of Lahore, it is concluded that protection from malaria would not be difficult or expensive there. There is a chain of pools along the sides of practically all the roads approaching the city and in some of these *Anopheles* larvae were found all the year round.

HIRST (S.). **On a New Variety of European Tick (*Dermacentor reticulatus*, var. *aulicus*, var. nov.)**—*Ann. Mag. Nat. Hist., London*, xvii, no. 100, April 1916, p. 308.

A preliminary account is given of *Dermacentor reticulatus*, var. *aulicus*, n., found on a wild boar killed in France.

STOREY (G.). **The Fumigation of Barracks against Bed-Bugs (*Cimex lectularius*, L.).**—*Agric. Jl. Egypt, Cairo*, v, (1915), nos. 1–2, 1916, pp. 81–83.

During the summer of 1915, the troops stationed in Egypt suffered serious discomfort from bed-bugs, which are numerous in nearly all the barracks. After the military authorities had unsuccessfully tried washing with paraffin and creosote, the Entomological Section of the Ministry of Agriculture tried fumigation with hydrocyanic acid gas. The method employed is described in detail, 1 oz. of cyanide and 1 oz. of sulphuric acid in 2 oz. of water being allowed for every 100 cubic feet of space. The gas was given four hours to act and then the rooms were fully ventilated for about two hours before they were entered. After the operation was finished, vast quantities of bugs were found to have been killed. The military authorities were so satisfied with the results that further requests for similar treatment were received and were carried out until the stock of cyanide was practically exhausted. This paper closes with notes on the proper construction and fitting of buildings with a view to the prevention of the necessity for fumigation.

CREEL (R. H.). **The Extension of Plague Infection of the Bubonic Type.**—*Amer. Jl. Public Health, Concord, N.H.*, vi, no. 3, March 1916, pp. 191–221, 4 sketch-maps.

The spread of bubonic plague in the New World is described. It is concluded that the transmission of plague by flea-infested clothing from a human case is a remote contingency and that the possibility of transmission by stray fleas in merchandise is evident, but improbable, because the habitat of plague-carrying fleas is in the burrows of rodents and on their bodies, and when temporarily separated therefrom, the natural tendency of the fleas is to regain that habitat. Diffusion of infection within a city results chiefly, if not entirely, from migration of infected rodents, and these latter when transported in merchandise are responsible for the spread of infection from one community to another. The reduction of rodents and the prevention of their dispersal should therefore be the chief prophylactic measures.

Ashworth (J. H.). **A Note on the Hibernation of Flies.**—*Scottish Naturalist, Edinburgh*, no. 52, April 1916, pp. 81–84.

The following flies were collected in a house in Edinburgh on 22nd February 1916:—*Limnophora septemnotata*, Zett., *Pyrellia eriophthalma*, Macq., *Muscina stabulans*, Fall., *Calliphora* (*Protocalliphora*) *groenlandica*, Zett., *Pollenia rudis*, F. The great majority of the specimens were *L. septemnotata*, while all were females except two examples of *M. stabulans.* A second inspection on 7th March resulted in the capture of large numbers of *L. septemnotata* and one specimen each of *M. stabulans* and *C. groenlandica*, all the specimens being females. *L. septemnotata* was very abundant during the past autumn and to a less extent during previous years. The rooms with a southern aspect were invaded during September and October and hibernation in various sheltered crevices began during November. The activity of the females was resumed on the return of favourable conditions.

Widmann (E.). **Beiträge zur Kenntnis der Biologie der Kleiderlaus und deren Bekämpfung.** [The biology of clothes lice and their control.]—*Bull. Inst. Pasteur, Paris*, xiv, no. 6, 30th March 1916, p. 190. [Abstract from *Zeitschr. f. Hygiene*, lxxx, 1915, p. 289.]

Development of the eggs of lice requires from six to seven days at a temperature of 78° to 85° Fahr. The optimum temperature is 82° Fahr. Development is retarded when the temperature is raised from 94° to 113° Fahr., as it also is at low temperatures from 68° Fahr. down to 13° Fahr. At 122° Fahr. the eggs are killed in 15 minutes, at 139° Fahr. in five minutes. The most efficient destructive agents are heat, then sulphurous anhydride and carbon bisulphide. These last ensure death of the eggs in 15 minutes. Tables are given showing the action of these various insecticides.

Heymann (B.). **Die Bekämpfung der Kleiderläuse.** [Combating clothes lice.]—*Bull. Inst. Pasteur, Paris*, xiv, no. 6, 30th March 1916, p. 191. [Abstract from *Zeitschr. f. Hygiene*, lxxx, 1915 p. 299.]

After dealing with the morphology and biology of *Pediculus humanus* (*vestimenti*), methods of destruction are discussed. Lice are killed in three hours at a temperature of 113° F., in 1½ hours at 122° F., in 20–30 minutes at 140° F., and in 5–10 minutes at 177° F. The eggs require a little longer time. In practice, heating for one hour at 140° F. should be sufficient. At a low temperature, 50–55° F., lice may be kept fasting for nine days, while at the temperature of garments (77–80° F.) they only live from three to five days without food. The action of various chemical agents is also dealt with.

Portchinsky (I. A.). **Муха Вольфарта и ея русскіе сородичи. Біологія этой мухи и значеніе ея для человѣка и для домашнихъ животныхъ.** [*Wohlfahrtia magnifica*, Schin., and allied Russian species. The biology of this fly and its importance to man and domestic animals.]—**«Труды Бюро по Энтомологіи Ученаго Комитета Министерства Земледѣлія.»** [*Memoirs of the Bureau of Entomology of the Scientific Committee of the Ministry of Agriculture*], *Petrograd*, xi, no. 9, 1916, 108 pp., 39 figs., 2 plates.

The author's previous work on *Wohlfahrtia magnifica* was published in 1874, 1875 and 1884 and first drew attention to the importance of this fly. The first part of this memoir deals with a number of cases of attacks on man by this insect. It is pointed out that even at the present time insufficient care is taken to identify the flies attacking man, and in many cases alleged to be due to *Calliphora*, *Sarcophaga*, etc., in the author's opinion, the real offender is *W. magnifica*. Many examples of myiasis in man caused by this fly are recorded and described from various parts of Russia, the ears, nose, etc., being most frequently attacked. The majority of cases occur in the hot weather from June to September. Within the auditory meatus the larvae usually penetrate into the walls and in rare cases they enter the cartilage. Cases of deafness resulting from the injury to the auditory meatus by the larvae and complete blocking of the meatus by inflammatory growths are not infrequent. Cases of myiasis of the eye are also common, and in one case 70 larvae extracted from one eye were sent to the author, although about half of those originally extracted were thrown away. As far back as 1770, a surgeon named Wohlfahrt described and figured larvae which he had extracted from the eye of a patient (*Nova acta phys. med. Akad. Caes. Leop. Car.* iv., 1770, p. 277) and the figures given by this author are excellent representations of the fly which now bears his name. For many years afterwards cases of myiasis due to this fly were attributed to *Sarcophila latifrons*, which really infests insects, principally locusts, or to *Sarcophaga carnaria*.

Among domestic animals the larvae of *W. magnifica* usually infest wounds on the bodies of cattle, horses, pigs, sheep, dogs and poultry, especially geese. The smallest wound is immediately infested with larvae, which soon enlarge it. In England, Holland and Denmark, where *W. magnifica* is absent, animals are often attacked by *Lucilia sericata*, Mg.; this fly is present also in Russia, but it never attacks animals there, being replaced by *W. magnifica*, whereas in the government of Petrograd, where neither of these two flies exist, their place is taken by *Lucilia caesar*, L. *W. magnifica* is particularly dangerous in cases of epizootics such as foot and mouth disease, as it infests the wounds on the feet and considerably increases the sufferings of the animals.

In dealing with the bionomics of this fly, it is stated that it only attacks living animals and that the statement of Brauer that it usually breeds in carcases and is only an occasional parasite of higher animals is incorrect. In Europe, this fly is absent from England, Holland, Denmark, Scandinavia, and the governments of Petrograd and Finland in European Russia, while it is rare in some other northern and north-western governments. Men are usually attacked in their sleep and therefore such cases occur oftener in Russia, where the people still live largely under natural conditions, particularly the nomads of the steppes and the agricultural population. Light and warmth are necessary conditions for the development of *W. magnifica* and it is most active during the hot hours of the day, disappearing early in the morning, in the evenings and in gloomy weather. Thus, it is most dangerous to sleep outdoors between 10 a.m. and 4 p.m. in countries infested with this fly. The insect practically never appears in houses, occurring mostly in fields, orchards and similar places, and until the females are sexually mature, they may be seen everywhere on flowers. Each female carries from 124 to 168 larvae, all of which mature at the same time and, immediately after deposition, hide in folds of the skin, wounds, etc. Unlike those of other flies, these larvae, the stages of which are described and figured in detail, never penetrate into the digestive organs.

The control of this pest is very difficult and, in addition to prevention of attack, consists in the removal and destruction of the larvae, which necessitates frequent inspection of the animals. The larvae are very tenacious of life, and will survive about two hours immersion in a 2 per 1,000 solution of corrosive sublimate or in 95 per cent. alcohol; about 1½ hours in a 5 per cent. solution of boric acid; about 30 minutes in a 2 per cent. and 10 minutes in a 5 per cent. solution of carbolic acid; they are able to survive for the same time in turpentine and in pure hydrochloric acid, but perish in one minute in sulphuric ether and in chloroform water (2 in 100). After remaining for about one hour in 95 per cent. alcohol the larvae, if taken out and placed in earth, are able to pupate and gives rise to adults. In the case of attacked animals, the larvae must be first removed with forceps and the wounds thoroughly cleaned and washed with a strong solution of lysol and powdered with naphthaline, or if possible, dressed with corrosive sublimate wool. When larvae have penetrated into the gums, inhalations of the steam from hot water poured over a handful of dry leaves, fruits or seeds of *Hyoscyamus*, the head of the patient being covered with a cloth, are useful, as after a few minutes the larvae will drop out; the same results may be obtained by throwing seeds of this plant on burning coal and inhaling the vapour. When the larvae infest the nose and the frontal sinuses, they can be removed by washing with creolin, sulphuric ether and chloroform water, after which a water douche must be used to remove any dead individuals. The use of snuff is not a good remedy, as the sneezing caused only expels the adult larvae.

Allied species, which occur in Russia are :—*W. meigeni*, Schin., the adult of which resembles that of *W. magnifica*, though the larvae differ considerably. The life-history of this fly is unknown. It occurs in Europe and in European Russia, except in the governments of Petrograd and Finland, and in Scandinavia. *W. intermedia*, Portsch., was found by the author in Orenburg, Samara, and once in Poltava; the imago resembles that of *W. meigeni*, but is smaller. The larvae however are twice as large as those of both the previous species; their armament is also different. *W. balassogloi*, Portsch., was first described in 1882 and is found in Orenburg, Stavropol and Astrachan, in Transcaucasia and in Central Asia; it is thought to be a parasite of locusts; this fly is the smallest of the series. *W. tetripunctata*, L. Duf., is found in south Europe, in Caucasia and Central Asia; its bionomics are practically unknown.

KING (W. V.). *Anopheles punctipennis*, **a Host of Tertian Malaria.**—*Amer. Jl. Trop. Dis & Prev. Med., New Orleans*, iii, no. 8, February 1916, pp. 426–432, 1 plate.

The matter in this paper has already been dealt with [see this *Review*, Ser. B, iv, p. 53].

SILER (J. F.). **Medical Notes on Jamaica. Part I: General Information Concerning Jamaica. Its Prevailing Diseases.**—*Amer. Jl. Trop. Dis. & Prev. Med., New Orleans*, iii, no. 8, February 1916, pp. 433–458.

In Jamaica, malaria ranks highest among the prevailing diseases. The north-eastern side of the island is given largely to the cultivation of bananas and the Superintending Medical Office has expressed the opinion that the cultivation of bananas and malaria go hand in hand, and that the necessary trenching required in banana culture furnishes excellent breeding places for mosquitos. Practically all admissions to hospitals for malaria from the north-eastern portion of the island are labourers from the banana estates. The highest admission rate occurs in December and it is during this month that the rainfall is greatest. The malaria–transmitting mosquitos of Jamaica are *Anopheles albimanus*, Wied. (aestivo-autumnal and tertian), *A. argyrotarsis*, R.D. (aestivo-autumnal and tertian), *A. crucians*, Weid. (aestivo-autumnal), *A. grabhami*, Theo., and *A. vestitipennis*, D. & K. *A. albimanus* is the principal carrier. *A. crucians*, though common in the United States, appears to be rare in Jamaica. The relationship of *A. grabhami* and *A. vestitipennis* to the transmission of malaria is not definitely known. Malaria prophylaxis is not practised systematically. Some mosquito control work—draining and oiling—has been undertaken in different parts of the island, but no systematic work on a large scale has been carried out. The dense undergrowth, the large banana estates and the abundance of water, make this type of work prohibitive under prevailing economic conditions.

Culex fatigans (*quinquefasciatus*), the transmitting agent of filariasis, has a fairly wide distribution in the island and the absence of the disease may be due to the fact that a sufficient number of cases have not been introduced. If this be not the case, it is due to some unknown factor which would merit further investigation.

SILER (J. F.). **Medical Notes on Jamaica. Part II: Pellagra in Jamaica.**—*Amer. Jl. Trop. Dis. & Prev. Med., New Orleans*, iii, no. 9, March 1916, pp. 481–502, 2 figs, 1 sketch-map.

The presence of pellagra in Jamaica in endemic form in but two places—the Lunatic Asylum and the Manning Home—its rarity in the district almshouses and the inability of the author and his companions to find it among the general population are very suggestive of a low-grade infection in which poor nutrition plays an important part as a predisposing factor. The hypothesis that this disease is transmitted by *Simulium* does not appear to be supported by observations made in Jamaica. The nearest possible breeding places of *Simulium* were about four miles distant from the Asylum and from about ten to fifteen miles in the case of the Home. No *Simulium* were seen near these institutions and enquiry failed to elicit any information suggestive of their presence.

TAYLOR (F. H.). **Contributions to a Knowledge of Australian Culicidae, no. ii.**—*Proc. Linn. Soc. New South Wales, Sydney,* xl, no. 1, 28th April 1915, pp. 176–184, 2 plates. [Received 12th April 1916.]

This is a description of the new and little known mosquitos already noticed in a previous report [see this *Review,* Ser. B, iv, p. 10].

TAYLOR (F. H.). **Australian Tabanidae, no. i.**—*Proc. Linn. Soc. New South Wales,* xl, no. 4, September to November 1915, pp. 806–815. [Received 18th April 1916.]

The following new species of the genus *Silvius,* subfamily PANGONIINAE, are described :—*S. hilli, S. sordidus, S. borealis, S. fuliginosus, S. trypherus, S. elongatulus* and *S. tabaniformis,* from the Northern Territory, and *S. fulvohirtus,* from Queensland. An additional record is given of *S. alcocki,* Summers, from Darwin, Northern Territory.

HOWLETT (F. M.). **Report of the Imperial Pathological Entomologist.**—*Rept. Agric. Research Institute, Pusa, 1914–15, Calcutta,* 1916, pp. 74–77. [Received 17th April 1916.]

Observations were made on the life-histories of insects which breed in decaying or septic animal matter. Against lice on sheep and goats, a lime-sulphur spray or wash, followed by a spray of weak vinegar, gave very beneficial results. Lice on man were affected to a marked degree by extremely small quantities of mercury compounds. Preliminary observations were made on the biting-reflex in the bed-bug. *Ornithodorus savignyi,* a possible disease-carrying tick, was studied. The life-histories of *Taeniorhynchus* sp. and *Culex gelidus* were determined, both species being troublesome to cattle, the latter frequently breeding in cattle urine. A survey of the breeding-places of mosquitos in Pusa was carried out during March. In order to determine the influence of local waters on breeding, experiments were made on the effect of equimolecular salt solutions on the larvae. The results showed that a high percentage of lime was beneficial to some species. The life-histories of three species of TABANIDAE and the Diopsid fly, *Sphyracephala hearseyana,* were worked out.

ROSS (W. A.). **Popular and Practical Entomology—Eradication of the Bedbug by Superheating.**—*Canadian Entomologist, London, Ont.,* xlviii, no. 3, March 1916, pp. 74–76.

When a building in Ontario, which was badly infested with *Cimex lectularius* (bed-bug), was submitted to a maximum temperature of 160° F. for 10 hours, all the stages were found to be destroyed.

ATKINSON (E. L.). **The Fly Pest in Gallipoli.**—*Jl. R. Naval Med. Service, London,* ii, no. 2, April 1916, pp. 147–152.

In the attempt to control the fly pest in Gallipoli, efforts were made to prevent breeding in dead bodies and in manure. During dry weather the latter was burned in heaps and by the aid of field incinerators built of stone. In wet weather the daily accumulation was buried as far as possible. In certain units, manure was allowed to accumulate; hence numerous flies, mainly *Calliphora*, spread over the clean areas. Ditches, drains and latrines were treated with chlorinated lime. A solution consisting of 2 lb. sodium arsenite, 10 lb. treacle, 10 gals. water and 2 pts. beer (if possible) was sprayed over shrubs, roofs, etc. Pieces of rag were soaked in it and hung about. A mixture of formalin, about 15 per cent. in milk, sweetened with sugar, was recommended for use in messes and dug-outs. A collection of the most prevalent flies was made, and the time of development ascertained. The most abundant were *Musca domestica*, *Fannia canicularis*, *F. scalaris*, *Stomoxys calcitrans*, *Calliphora vomitoria*, *C. erythrocephala*, *Lucilia caesar*, *Sarcophaga carnaria* and *Muscina stabulans*.

Tests made in October 1915, with a sample of Liquid " C," showed that this liquid was the best fly antidote so far used. Bodies were mummified by its action and rendered inoffensive, even after and during a fall of rain. It was a definite repellant and killed adults readily. Larvae were killed in many cases, but results in this connection at Helles were not entirely satisfactory. Care was needed in applying the liquid, since it had an irritating effect on the skin and was extremely inflammable.

MITZMAIN (M. B.). *Anopheles crucians*, **their infectibility with the parasites of tertian malaria.**—*U. S. Public Health Reports, Washington, D.C.*, xxxi, no. 12, 24th March 1916, pp. 764–765.

In view of the common impression that *Anopheles crucians*, Wied., is susceptible to infection with the parasites of aestivo-autumnal malaria (*Plasmodium falciparum*) only, it is of interest to record experimental results in connection with this species and tertian fever (*P. vivax*). In the course of a series of experiments with *A. punctipennis*, 19 specimens of *A. crucians* were fed simultaneously on the 6th and 7th February 1916 on the blood of an individual suffering from tertian malaria. Examination of the blood of this case showed large numbers of asexual parasites and but few mature gametocytes. Seven of the specimens died within five days after feeding; three of these were found to contain numerous immature zygotes, and in one that had died on the second day, the vermiculus stage was identified in the crushed stomach contents. Two of the twelve survivors were found to be infected, eleven and thirteen days respectively after the feed. In both mosquitos the salivary glands harboured sporozoites.

ROSS (T. S.). **Flies in a Jail.**—*Ind. Med. Gaz., Calcutta*, li, no. 4, April 1916, pp. 133–134.

Though the Tanjore District jail and its surroundings are all that can be desired sanitarily, flies swarmed within the premises and were thought to be the cause of the prevalence of dysentery and of a small outbreak of enteric fever in 1914. Killing the flies with flappers and traps of condensed milk and other articles of food treated with formalin proved useless and a very careful search was then made for breeding places. A few larvae were found in a rubbish heap; rubbish was thereafter buried in pits and well covered with earth. It was ultimately found that flies were breeding in large numbers in the latrine trenches just outside the jail, in spite of the fact that the trenching was carried out most carefully and that a covering of five inches of earth was used. Flies began to appear about ten days after the trench was filled, reached their maximum in about a month and then continued appearing for about a fortnight. It was found that the mature larva makes its way into the earth covering the excreta and pupates when it arrives just below the surface. The earth covering therefore actually assists the issue of flies and the more carefully the trenching is carried out, the more securely are the larvae protected against their natural enemies. The crows and kites which feed on the larvae in badly-managed trenching grounds, were not present. This discovery pointed to the desirability of destroying the eggs or larvae in the excrement prior to covering it. Of three contiguous pits, one was covered in the ordinary way, in the second a pint of borax solution (1 dram to a pint of water) was poured over the excreta and in the third a quarter of a pint of crude petroleum was sprinkled. All the pits were covered with earth ; gauze frames placed over them showed that 446 flies emerged from the first, 61 from the second, and 246 from the third. The experiment was repeated on a fresh series of three pits with stronger solutions of borax and with the same amount of crude petroleum, no control pit being used. From the petroleum pit 34 flies issued, from the pit with borax, half an ounce to the pint, 77 flies issued, and from the third pit with borax, one ounce to the pint, 74 flies issued. The experiments were not completed as the author was transferred. The monthly cost of petroleum locally would be about 3s. 4d. for the total jail population of about 450 and with double this amount it seems likely that the breeding could be completely stopped. That the flies were probably responsible for the dysentery is shown by the fact that in 1915 there were only five cases among the convicts compared with an average of 27·6 for the previous five years. No case of enteric occurred in 1915.

Sergent (Edm.) & Sergent (Et.). **Alternance des écoulements d'eau, principe directeur des mesures antilarvaires.** [The alternation of water out-flows as the leading principle of antilarval measures.]—*La Malariologia, Naples,* (Ser I, ix, no. 1) Ser. II, i, no. 1, 29th February 1916, pp. 3–9, 4 figs.

At the beginning of their anti-malarial campaigns in Algeria in 1902 the authors established anti-mosquito brigades, which required continual supervision, much work and considerable expense. Experience has suggested a new method which is extremely simple, always efficient, and very cheap, as one or two workmen require but a few minutes each week to carry it out. This new method is often the only anti-larval measure necessary and is based on the fact that in the Algerian Tell region, i.e., the region suitable for colonisation, Anopheline larvae live on an average for three weeks. Thus the formation of a breeding place may be tolerated without any danger ensuing, provided it is automatically dried up in less than three weeks, thus destroying the larvae. To obtain this result it is sufficient to prevent the water from remaining more than one week in one and the same spot. In practice this is attained by alternating the out-flow of the water each week. Two drain-channels, instead of one, must be made for each spring, and during the summer one of these will be used for one week and then dammed up while the water is allowed to flow into the other. The channel not in use will dry up during the week, so that these outlets may be regarded as mosquito traps. By applying this principle to irrigation, breeding places may be rendered harmless without prejudice to agricultural requirements.

Canalis (P.). **Some experiments on the insecticidal action of Clayton gas.**—*Bull. Mens. Office Internat. d'Hyg. Publique, Paris*, viii, no. 3, March 1916, pp. 457–463.

This paper describes experiments with Clayton gas against fleas, bugs and cockroaches. These were made in a large room of the Genoa maritime sanitary station and in the holds of five vessels in the harbour. It was found that in all cases the gas at 2 or 3½ per cent. strength killed the innumerable cockroaches and fleas as well as the bugs and their eggs. The time required to reach the above strength varied with the size of the spaces dealt with, in the case of those of from 80 to 750 cubic metres, four hours were sufficient. The gas is always more concentrated in the lower strata, so that when the upper spaces contain a strength of 2 per cent., the destruction of the insects may be considered certain. Detailed tables are given in the case of each experiment.

Roberts (N.) & Robertson (G. E.). **Fumigation of the U.S.S. Tennessee by the Cyanid Method.**—*U. S. Naval Med. Bull., Washington, D.C.*, x, no. 2, April 1916, p. 296.

The methods by which the U.S.S. Tennessee was fumigated at the Navy Yard, Philadelphia, Pa., in September 1915, to rid her of rats, cockroaches and bed-bugs, is described. The material required was 750 lb. of sodium cyanide (in egg-shaped lumps weighing 1 oz. each), 1,000 lb. of sulphuric acid, 400 three-gallon (U.S. gallon) cedar buckets, 25 lb. of paraffin, 50 lb. of washing soda, 400 two-pound paper bags, about 800 labels, and two large barrels. Every compartment in the ship was tabulated and the cubic space estimated, except the double bottoms and the magazines, which were considered to be uninfested as they were habitually closed off from the ship proper. One bucket was allowed to every 3,000 cubic feet. The planning of the route to be followed by the operators was the most difficult part of the fumigation, insomuch as the party had to go into every part of the ship, start the generators, escape and shut the entrance behind them without at any time passing through any space already containing gas. The cedar buckets were paraffined to prevent their destruction by the acid. They were filled from the barrels in which the acid and water were mixed. About two or three quarts of the diluted acid was used per bucket. Each bucket was labelled to show the amount of acid it contained and its destination. The paper bags were simultaneously filled with cyanide, labelled and distributed. By dropping the bags into the buckets (instead of emptying their contents) additional safety was ensured by the slight delay in the generation of the gas. The ship was kept closed for fourteen hours and the crew were not allowed on board until eighteen hours after the ship was opened. Three months after fumigation the ship was still free from rats, there were only a few cockroaches and, it is believed, no bed-bugs.

Mosquito Conditions in Connecticut in 1915.—*Rept. Connecticut Agric. Expt. Sta., 1915, New Haven*, 1916, pp. 140–144. [Received 25th April 1916.]

In May 1915 a new law was passed providing for the elimination of mosquito breeding places. The text of the bill is given. Mosquitos, especially *Ochlerotatus* (*Aedes*) *sollicitans*, Walk., were very abundant during the year, on account of the heavy rains and high tides in July and August, and the consequent flooding of many salt marshes. In the anti-mosquito measures carried out, old ditches in various localities were maintained and a new ditch cut in one district. A portion of West River was oiled to destroy larvae of *Culex pipiens*. Surveys of several districts were made with a view to carrying out control measures.

Buttrick (P. L.). **Report on a Mosquito Survey at the Mouth of the Connecticut River.**—*Rept. Connecticut Agric. Expt. Sta., 1915, New Haven*, 1916, pp. 144–172, 1 map. [Received 12th April 1916.]

Four classes of marshes are distinguished in the area surveyed:—(1) Areas covered with *Zizania aquatica* (wild rice), which do not breed mosquitos; (2) so-called sedge grass marshes, flooded at certain tides, in which breeding is abundant; (3) marshes less frequently flooded and at a higher level than the preceding, where breeding is also less rapid; (4) areas further from the shore, rarely flooded by salt water but more frequently by fresh water; this type only forms a casual breeding place of either fresh or salt water forms. The commonest mosquito is *Ochlerotatus* (*Aedes*) *sollicitans*, Walk., breeding in salt marshes. The eggs are laid on the mud of the marsh; they hatch when covered with water, and adults emerge in about a week under warm conditions. They then invade the uplands, often flying for several miles. Ordinarily, the marshes are flooded once or twice a month; as a result, one or two broods of mosquitos are produced monthly. The date of emergence can be predicted in certain parts, but where conditions are complicated by the rise and fall of the river, the time of flooding is irregular.

Breeding of *O. sollicitans* can be prevented by a system of drainage by which flood water is not allowed to stand on the marsh. Such a system requires a clear outlet, a main drainage course, and a system of parallel ditches from 10 to 18 inches wide and from 24 to 36 inches deep cut at distances varying from 100 to 300 feet apart, at right angles to the main course. The ditches should have straight sides and should be cleaned each spring and inspected at intervals during the breeding season. Besides eliminating mosquitos, ditching has the effect of increasing the hay yield of the area drained. The estimated cost of eliminating all salt marsh and the more important fresh water breeding areas in the region of this survey is about £3,800. The paper concludes with a detailed description of individual breeding areas in the region under consideration.

Duckett (A. B.). **Notes on a little-known Rabbit Ear-Mite (*Psoroptes cuniculi*, Mégnin).**—*Proc. Entom. Soc. Washington, Washington, D.C.*, xviii, no. 1, March 1916. p. 17.

During April 1915, two rabbits used for experimental purposes died from the effects of ear mange, caused by *Psoroptes cuniculi*, a mite hitherto unrecorded in America. Examination showed cerebral disturbances, the mites having penetrated to within five millimetres of the brain. *Listrophorus gibbus*, Pasquest, a European species of mite, was also observed for the first time on the hair of rabbits.

Townsend (C. H. T.). **Non-intentional Dispersal of Muscoid Species by Man, with particular Reference to Tachinid Species.**—*Proc. Entom. Soc. Washington, Washington, D.C.*, xviii, no. 1, March 1916, pp. 18–20.

The conditions necessary for the effective dispersal of insects to new countries are (1) the maintenance during transit of the conditions under which a given species normally breeds or lives in either a quiescent or active state, and (2) the presence of the same conditions in the country of introduction. The flies whose larvae normally live in the dung of domestic animals, such as *Musca* (*Promusca*) *domestica*, *Stomoxys calcitrans*, *Lyperosia* (*Haematobia*) *irritans*, *Muscina stabulans*, etc., are easily carried to all parts of the world to which cattle and like animals are shipped, since the required conditions are present. *Chrysomyia* (*Cochliomyia*) *macellaria*, infesting open wounds and fresh carcases, and *Cynomyia mortuorum*, inhabiting older carcases, remain confined to America and Europe respectively, since the first requirement is practically always wanting. In cases in which the larvae are parasitic in insect hosts and remain dormant in the earth in the pupal stage, the second condition is lacking, and even when aided by man, establishment is extremely difficult. It is very doubtful whether any of the Tachinids regarded as common to Europe and North America are really so. The existence of a closely similar species in the country of introduction constitutes a bar to establishment, since the foreign species is often swallowed up by the native species through interbreeding, the issue apparently inheriting the physiological characters of the latter. The identification of species outside their natural faunal limits is therefore of great difficulty and involves a consideration of the principles governing dispersal.

Banks (N.). **The Acarina or Mites.**—*U.S. Dept. Agric., Washington, D.C.*, Rept. no. 108, 15th December 1915, pp. 153, 294 figs. [Received 8th May 1916.]

This paper is intended for the use of economic entomologists. The distribution of the various species of Acarina in America is given in detail with keys to all the known American genera. A list of works useful in the study of American Acarina is appended.

Prince (J. A. Le) & Orenstein (A. J.). **Mosquito Control in Panama; with an introduction by L. O. Howard, U.S. Bureau of Entomology.** *New York and London:* G. P. Putnam's Sons, 1916, pp. xvii + 335, 100 illust., Price $2.50 net.

This book is an account of the work done in Cuba and Panama in controlling mosquitos. The first chapter deals with the campaign at Havana which began in 1901 at a time when relatively little was known of the habits and life-history of *Anopheles*. The season of prevalence of *Anopheles* in Cuba is much shorter than on the Isthmus, and oiling at irregular intervals gave satisfactory results. The reason why Anopheline eggs are not laid in certain apparently suitable areas, is as yet unexplained. The work on the Isthmus is traced from 1904 and it is stated that the sites selected by the French for housing and hospital accommodation were excellent, considering the limited knowledge of the aetiology of malaria existing at the time. The magnificent gardens of the hospital at Ancon had however been converted into almost perfect breeding grounds for mosquitos, by the placing of shallow water troughs round all the trees and shrubs as a protection against ants. The local meteorological and topographical conditions, and the changes produced by the canal works and their bearing on the local Anopheline are described.

The following list of Anophelines of the Canal Zone is given: *Anopheles argyrotarsis*, R.D.; *A. tarsimaculatus*, Goeldi; *A. gorgasi*, D.K.; *A. albimanus*, Wied.; *A. cruzii*, D.K.; *A. apicimacula*, D.K.; *A. punctimacula*, D.K.; *A. malefactor*, D.K.; *A. eiseni*, Coq.; *A. franciscanus*, McCrack.; *A. pseudopunctipennis*, Theo. The commonest species are *A. albimanus*, *A. pseudopunctipennis* and *A. malefactor*, but the predominence of a species varies from season to season and place to place. *A. tarsimaculatus* appears only to occur near the Atlantic. The commoner species of the canal zone may be divided into three groups:—(*a*) the white hind-footed group, comprising: *A. argyrotarsis*, *A. albimanus* and *A. tarsimaculatus*; (*b*) the group with uniformly coloured legs, comprising: *A. pseudopunctipennis* and *A. franciscanus*; and (*c*) the spotted-leg group, comprising: *A. malefactor* and *A. apicimacula*.

The larvae of *Stegomyia fasciata* and of Anophelines are seldom found in the same water, the former being almost confined to containers near dwellings, in which the latter do not breed on the Isthmus. Anopheline larvae are frequently found in hoof-prints and wheel ruts. The floods of the rainy season flush great numbers of these breeding places and remove obstructions, enabling the water to drain off, but on the other hand depressions become filled, and large breeding areas may be formed. Extensive growths of algae in streams greatly favour mosquitos, and oiling often tends to mat them together; it is thus very important to keep the banks of streams well trimmed and to ensure by every means a steady and rapid flow of water. These and many other causes of the natural or artificial production of breeding areas are discussed in detail.

In Chapter VI. the habitat and food of adult Anophelines are discussed. The authors state that during the years 1904–1912 not a single case of biting in full sunlight was recorded, though later, at

Gatun, they were freely attacked in sunlight by *A. tarsimaculatus* and *A. albimanus*. In the dark, the light of a lantern protected the illuminated part of the body, and observers standing in the direct rays of an acetylene lamp were not bitten, though the shadow even of a finger permitted the attack of *A. albimanus* at once. Anophelines are most voracious at dusk and soon after dawn, and the exceptional biting in daylight at Gatun may perhaps be explained by the urgent need of blood. Though hundreds of Culicines are found dead in the globes of electric lights, Anophelines are practically never thus attracted.

A. albimanus usually flies against light breezes and this species travels much further from its breeding grounds than *A. pseudopunctipennis* or *A. malefactor*. Details are given of many interesting observations on the flight of mosquitos and of the methods used for staining individuals in order to determine the length of flight. Of 40 stained specimens recovered, 24 were found to have travelled from 1,300 to 1,600 yards from the point of liberation.

In the filling of depressions, which is a necessary part of anti-mosquito work, the surface cracks which form must be carefully filled up, and every precaution must be taken against subsoil water collecting either under the made soil or in the borrow pits. The use of drains, and the best mode of construction in order to prevent them from becoming breeding places, is dealt with at length.

The problem of oiling on a large scale is fully considered. The oil kills either from specific toxicity or by clogging the breathing tubes, or possibly by reducing the surface tension and making it difficult for the larvae to remain long enough at the surface to rupture the film and obtain air. The objection to kerosene is that the film is so thin that it is easily broken by floating material and other causes; it is expensive and is apt to be wasted because it is difficult to see where the film is satisfactory. It is also liable to take fire from sparks, etc., especially near a railway. Crude oil of asphaltum is extensively used in Panama, as it is cheap, though its poor spreading qualities would make it unsuitable in any other climate. Various methods of oiling are described in detail, especially the drip method; for small streams, etc., small bundles of cotton waste soaked in oil and kept in place by tying to a stone or some fixed object, are said to be very effective, and to give a film of oil for a week or more; the waste can be used again and again. The oil used on the Canal Zone for these purposes amounts to about half a million gallons annually. An extensive plant has been laid down at Ancon for the production of a special larvicide, the formula of which is as follows:—Resin 150–200 lb., soda 30 lb., crude carbolic acid, (gravity 0·97), 150 U.S. galls. These are boiled together in a special apparatus and the product is a black, liquid, resin soap which emulsifies freely with fresh water. The carbolic acid must contain at least 15 % of phenol, and must not be of a higher gravity than that stated; if the larvicide is of standard strength and quality, an emulsion of 1 in 5,000 should kill an Anopheline larva in ten minutes. This preparation is cheap; the high concentration saves cost in transport; its action is very uniform and rapid; it is easily made; is harmless or nearly so to the higher animals; there is no risk from fire; it kills larvae embedded in mud; it kills algae and grasses. The disadvantages are: It does not emulsify and is inert in brackish water; it must be kept in closed vessels; it rapidly loses its toxicity when mixed with water containing algae and other organic matter.

In a chapter on natural enemies the value of small fish and the limitations of their action are discussed at length; the larvae of dragonflies and water beetles were found to be of great value in places where fish could not live; certain birds, especially night jars, as well as bats, consume large numbers of adult mosquitos.

The use of screens and the destruction of adult Anophelines in houses are dealt with at length. In Panama only the best copper gauze, made of wire one-hundredth of an inch in diameter and having 18 strands to the inch, can be used; 18 mesh No. 31, B.W.G. is the technical description of this gauze. Useful hints on construction and fitting and for the adaptation of screening to tents and railway cars are given. Stress is laid upon the fact that defective and damaged screening is worse than none at all. Details of the construction of gauze labyrinth traps, which are said to be very useful, are also given; these should be attached to the lee side of buildings for Anophelines and to the windward side for Culicines. This part of the work concludes with a chapter on the results obtained; the accompanying chart, showing the percentage of cases among the employés of the Isthmian Canal Commission from November 1905 to December 1913, demonstrates that scientific warfare against mosquitos has made the Canal Zone habitable and rendered possible the construction of the canal.

The second portion of the book, comprising 93 pages, is devoted to the campaign in Havana and on the Isthmus against yellow fever. The importation into the Canal Zone of large numbers of non-immune labourers presented serious possibilities, and every possible measure was and has been taken to protect them from infection. Attention is drawn to the danger of infection by what are known as walking cases of yellow fever—i.e., so slight as not to prevent the sufferer from going about. The opinion is however expressed that the complete suppression of *Stegomyia* is not necessary, though desirable, and that its reduction in a given locality to a point below that required to propagate the disease is sufficient; what this point should be, must be settled for each separate locality and would vary with the number of cases present.

This book is an exceedingly clear and well written record of probably the largest sanitary work ever undertaken. The maps and illustrations are well chosen and give a clear idea of the conditions under which the work was carried out and the difficulties to be contended with. The style of the book is such as to be readily comprehensible to the layman, and it is perhaps the best general testimonial to the great importance of Applied Entomology that has appeared for some time.

NOTICES OF ENTOMOLOGICAL APPOINTMENTS, &c.

Dr. Alfred E. Cameron, formerly of the Department of Agricultural Entomology, Victoria University, Manchester, has taken up duties in the Entomological Branch, Department of Agriculture, Ottawa, Canada.

Messrs. A. J. Grove and L. Harrison have been appointed by the War Office to advise on Entomological problems in connection with the military operations in Mesopotamia.

The services of Dr. W. A. Lamborn have been lent by the Imperial Bureau of Entomology to the War Office and he is now attached to the Expeditionary Force in East Africa.

Mr. C. B. Williams has been appointed by the Board of Agriculture, Trinidad, to study the parasites of the Sugar-cane Froghopper in that island.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.

Mosquito Nets suitable for Troops 85
Anopheles and Malaria in Morocco 85
The Relation between Flies and Leprosy 85
Anopheles and Malaria in the Punjab 86
A New Variety of *Dermacentor reticulatus* in France 86
Fumigation with Hydrocyanic Acid against Bed-Bugs in Egypt .. 86
The Causes of the Spread of Bubonic Plague 86
The Hibernation of Flies in Scotland 87
The Control of Lice 87
The Bionomics of *Wohlfahrtia magnifica* in Russia 88
Anopheles punctipennis, a Carrier of Tertian Malaria in the U.S.A. 90
Malaria and Mosquitos in Jamaica 90
The Relations between Pellagra and *Simulium* in Jamaica .. 90
New Australian Mosquitos 91
New Species of *Silvius* in Australia 91
Insects and Ticks injurious to Man and Animals in India 91
The Use of Heat in destroying Bed-bugs 91
The Control of Flies in Gallipoli 91
Anopheles crucians, an experimental Carrier of Tertian Malaria in the U.S.A. 92
The Control of Flies in Jails in India 92
Measures against Mosquito Larvae in Algeria 93
The Fumigation of Ships with Clayton Gas 94
Methods of fumigating Ships with Hydrocyanic Gas 94
Mosquito Control in Connecticut 95
The Breeding Places of Mosquitos in Connecticut 95
A little-known Rabbit Ear-Mite, *Psoroptes cuniculi*, in the U.S.A. 96
The Dispersal of Muscid Flies by Man 96
The Acarina of the U.S.A. 96
Mosquito Control in Panama (Review) 97

VOL. IV. Ser. B. Part 7.—pp. 101-116. JULY, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

National Museum

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., *Chairman.*

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.

Dr. Guy A. K. Marshall.

Assistant Director.	Assistant Editor.
Mr. S. A. Neave.	Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—27, Elvaston Place, London, S.W.

Chun (J. W. H.). **Horse Flies and Anthrax.**—*China Med. Jl., Shanghai*, xxx, pt. 2, March 1916, pp. 89–91.

Three cases of fatal cutaneous anthrax are reported from Harbin following on the bite of Tabanids, and it is inferred from the circumstances that the flies became infected from horses suffering from anthrax, which appears to be fairly common in this region.

Roubaud (E.). **Présentation d'un *Anopheles maculipennis* capturé à Paris.** [A Record of an *Anopheles maculipennis* captured in Paris.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 4, 12th April 1916, p. 203.

A female example of *Anopheles maculipennis*, Meig., captured in the Pasteur Institute, lived for 24 hours on sugary substances, but refused to bite. Anopheline larvae are well-known in the suburbs of Paris, but their occurrence in Paris itself is rather improbable, although it was from a specimen taken in the Faubourg St. Jacques that Joblot, in 1754, drew the first figure known of these larvae. The presence of adults has not been previously reported in Paris itself though there is nothing to prevent specimens being carried from time to time into the city.

Yakimoff (W. L.), Schokhor (N. J.) & Koselkine (P. M.). **Spirochétose des poules au Turkestan russe.** [Spirochaetosis of fowls in Russian Turkestan.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 4, 12th April 1916, pp. 227–228.

With regard to the transmission of spirochaetosis of fowls in Turkestan, it is stated that in one case where an epizootic existed in a fowl-yard, although it was not possible to examine the blood of the birds, a number of *Argas persicus* from them were obtained and these transmitted infection to other fowls.

Rodhain (J.) & Van den Branden (F.). **Sur la réceptivité de la roussette, *Cynonycteris straminea*, aux differents virus de trypanosomes africains.** [The susceptibility of the flying-fox, *Cynonycteris straminea*, to different strains of African trypanosomes.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 4, April 1916, pp. 234–236.

Attempts to infect flying-foxes (*Cynonycteris straminea*) with *T. lewisi*, *T. cazalboui* (*vivax-angolense*) and *T. congolense*, failed. Two were infected with *T. gambiense* and death occurred in 52 and 68 days respectively. It was found that *T. gambiense* does not develop in *Cyclopodia greeffi*, with which Nycteribiid the animals were infested.

Bouet (G.) & Roubaud (E.). **Nouvelle contribution à l'Etude des Chéromyies de l'Afrique Occidentale française.** [A new contribution to the study of the *Chœromyia* of French West Africa.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 4, 12th April 1916, pp. 242–243.

Both *Choeromyia choerophaga* and *C. boueti* were found in large numbers during a recent journey in Lower Senegal. These flies are specially parasitic on *Orycteropus* (antbears) and warthogs in West

Smithsonian Institution AUG 28 1916 National Museum

Africa and were found together in their burrows. They were also found, together with *Cordylobia anthropophaga* and *Auchmeromyia luteola,* in huts and in holes in trees. The great predominance of males in the burrows was noticeable, whereas females predominated in huts and in tree-holes. The females seem therefore to seek the open at certain periods of the year, at least. Of special importance is the presence of the female *Choeromyia* in human dwellings in company with *A. luteola* and *C. anthropophaga.* Probably further investigations will show the occasional parasitism on man of larvae from the burrows of hairless animals. It is suggested that the same association may exist between man, these flies and warthogs as lately shown by Lloyd in the case of *Ornithodorus moubata* in Rhodesia [see this *Review,* Ser. B, iv, 3, p. 44].

LAVERAN (A.) & ROUBAUD (E.). **Sur un Myriapode ayant séjourné dans les fosses nasales d'un homme.** [A Myriapod living in the nasal cavity of a man.]—*Bull. Soc. Path. Exot., Paris,* ix, no. 4, 12th April 1916, pp. 244–246, 1 fig.

A female specimen of the Myriapod, *Geophilus carpophagus,* Leach, was received at the Pasteur Institute, Paris, in March 1916 from Dr. Gapin, one of whose patients had expelled it when blowing his nose. The parasite measured nearly 2¼ inches in length and had apparently been living in the nasal cavity for several months, causing headache and vertigo, which ceased immediately the cause was expelled. *G. carpophagus* is a very common species in France and this individual is believed to have entered by the nostrils when quite small.

GRIMSHAW (P. H.). **Flies in a Perthshire House.**—*Scottish Naturalist, Edinburgh,* no. 53, May 1916, p. 114.

A collection of hibernating flies obtained in a house in Perthshire included :—47 *Limnophora septemnotata,* Ztt., all females ; 35 males and 44 females of *Pollenia rudis,* F. ; 48 males and 20 females of *Pyrellia eriophthalma,* Mcq. ; 1 male and 2 females of *Calliphora erythrocephala,* Mg. ; 1 male and 2 females of *C. groenlandica,* Ztt. ; 1 female of *Musca domestica,* L. ; 4 specimens of *Oecothea fenestralis,* Fln. ; 2 females of *Aphiochoeta rufipes,* Mg. Two Mycetophilids, some Chalcids and one Coccinellid, *Adalia obliterata,* L., were also present. From the number of insects in each room, there appeared to be no evidence of a marked preference for any particular aspect.

BASILE (C.). **Leishmaniosi interna.** [Internal Leishmaniasis.]—*Annali d'Igiene, Rome,* xxvi, no. 4, 30th April 1916, pp. 248–268, 6 figs.

The discovery of the existence of leishmaniasis of the internal organs has somewhat upset the theories held as to the causation of the various other forms of this disease by a specific parasite. A résumé of the history and distribution of the disease is given, with a summary of information as to the parasites, methods of artificial cultivation, and the general results obtained by the inoculation of animals. Patton's statement that *Cimex hemiptera* (*rotundatus*) was a transmitting agent was followed by that of Donovan with regard to *Triatoma* (*Conorrhinus*) *rubrofasciata.* Patton also studied the behaviour of the organisms in *Culex fatigans, Anopheles stephensi, Stegomyia sugens, Ornithodorus moubata, Pulex irritans* and *Ctenocephalus canis* with negative results, whereas the whole cycle of evolution was observed to take place in *Cimex lectularius* and *C. hemiptera.* While Patton readily inoculated dogs and monkeys with the virus of the Indian form of the disease obtained from man, he was unable to produce infection by the use of bugs as transmitting agents, and it still remains to be proved that the organisms observed by him in *Cimex* are pathogenic to dogs, monkeys or white rats; the position of his work is compared with that of Brumpt on the development of trypanosomes in the bodies of *Cimex boueti* and *Ornithodorus moubata,* though neither is capable of transmitting the organisms. The discovery of Nicolle that the organism of Mediterranean kala-azar was identical with that of *Leishmania infantum* led to the conclusion that children were infected from dogs, and the canine and infantile forms are now regarded as identical. The author, by a process of exhaustion, arrived at the conclusion that fleas were the carriers and was able to transmit the disease through *Ctenocephalus canis* (*serraticeps*) which had been fed on the spleen of a badly infected dog. It is now considered proved that the vertebrate host may be infected either by direct puncture of an infective insect or by contamination with its faeces. Laveran and Franchini obtained direct infection in mice through fleas which had been allowed to bite a dog infected with *Herpetomonas ctenocephali.* Rats have been infected with *Herpetomonas pattoni* through *Ceratophyllus fasciatus,* with *Crithidia melophagi* through *Melophagus ovinus,* and with *C. fasciculata* through *Anopheles.* Fantham and Porter have also obtained experimental transmission of the flagellates of various insects, including :—*Nepa cinerea, Ctenocephalus canis, Stratiomyia chameleon* and *S. potamida, Pediculus capitis* and *Gerris fossarum* either by ingestion or injection of material into the peritoneum; the organism so introduced lives and multiplies in the blood and internal organs of mice and dogs, giving rise to an infection having symptoms of internal leishmaniasis; the experiments were extended to fish, frogs, toads, lizards and snakes with similar results. Sergent, Lhéritier and Lemaire have advanced the hypothesis that *Phlebotomus minutus* is a carrier and that the source of infection at Biskra is the local gecko [*Tarentola mauritanica*]. [See this *Review,* Ser. B, iii, pp. 143, 230–231.] The symptoms, pathological anatomy and treatment of the disease are discussed. Prophylaxis is difficult, as the precise mode of transmission and the necessary conditions are still a little obscure. Price and Rogers noticed in India that segregation of the sick diminished the numbers of new cases to a remarkable degree [see this *Review,* Ser. B, ii, p. 67–68]. Young made the same observation in Assam, and was of opinion that the disease was transmitted from man to man by biting insects living in the dwellings of attacked persons. In India there is no real proof of the existence of canine leishmaniasis. In the Mediterranean region adults are rarely attacked, children suffering almost exclusively, and here the connection with dogs is more or less clear. Dogs sick of the disease rarely leave the houses and a strict suppression of them is suggested. The author, in 1909, collected practically all the infected dogs in Bordonaro, and whereas many cases were notified in children in that year, there were none in 1910 and only one in 1911.

Filippini (A.). **Tossicità della benzina usata quale pediculicida.** [The toxicity of benzine used against lice.]—*Annali d'Igiene, Rome,* xxvi, no. 4, 30th April 1916, pp. 268–269.

In treating lice on the head, soldiers in the field have been found to suffer headache and other troubles as the result of copious applications of benzine, followed by the wearing of an air-tight head covering. Ordinary benzine is a mixture of hydrocarbides of the fatty series of the general formula C_nH_{2n}, while benzole is a hydrocarbide of the aromatic series, defined chemically as C_6H_6 and these two products are often confused in toxicological literature. Both of them are dangerous to inhale and the cases referred to above appear to be acute poisoning due to inhaling the benzine vapours. Action on the skin and chronic lesions take a long time to develop. Petroleum may with advantage be substituted for benzine for insecticidal purposes; its action is more certain (benzine often only stupefying the parasites, which recover once the vapour has disappeared), it is less inflammable and practically non-poisonous. Its smell is the only disadvantage.

Orenstein (A. J.). **The Problems and Principles of Malaria Prevention.**—*South African Jl. Sci., Cape Town,* xii, no. 6, January 1916, pp. 193–199. [Received 9th May 1916.]

In this review of the relations between mosquitos and malaria the following Anophelines are recorded as capable of transmitting the disease :—*Anopheles maculipennis,* Meig.; *A. bifurcatus,* L.; *A. pseudopunctipennis,* Theo.; *A. tarsimaculatus,* Goeldi; *A. formosaensis,* Tsuzuki; *A.* (*Cellia*) *albimanus,* Wied.; *A.* (*C.*) *agyrotarsis,* R. D.; *A.* (*C.*) *pharoensis,* Theo.; *A.* (*Myzomyia*) *listoni,* Liston; *A.* (*M.*) *funestus,* Giles; *M. turkhudi,* Liston (*hispaniola,* Theo.); *A.* (*Myzorhynchus*) *barbirostris,* van der Wulp; *A. sinensis,* Wied.; *A. umbrosus,* Theo.; *A.* (*Nyssorhynchus*) *annulipes,* Walk.; *A. fuliginosus,* Giles; *A. maculipalpis,* Giles; *A. stephensi,* Liston; *A. theobaldi,* Giles; *A. willmori,* Theo.; *A.* (*Pyretophorus*) *costalis,* Loew; *A.* (*P.*) *superpictus,* Grassi; and *A. myzomyifacies,* Theo.

The fact that cases of disease may be infrequent in a district in which both human carriers and insect transmitters are present is important in an anti-malarial campaign, since it is sufficient to reduce both the Anophelinae and the human parasites to what has been termed "the non-infective minimum," and to maintain them at that level. The sexual form of the malarial parasite has been found to occur in numerous individuals who show no signs of disease, since they have been more or less immune through successive attacks. Such individuals are a source of danger to the community.

Malaria prevention can be carried out along five lines :—(1) The elimination of human carriers only; (2) the reduction to a non-infective minimum of the number of malaria-transmitting mosquitos; (3) the protection of individuals against bites of mosquitos; (4) the protection of individuals by means of drugs against the development of the parasite in the blood; (5) a combination of several or all of these methods. The first method is impracticable since it involves the systematic blood examination of all members of a community and intensive treatment of all affected persons. The second plan has been carried out in Khartoum, Ismailia, and Panama and has given very promising results. It involves a preliminary study of the following points :—(1) The incidence rate of malaria in the given locality ; (2) the species of Anophelines prevalent ; (3) the life-cycle and breeding habits of malaria-transmitting species ; (4) the probable flight ranges of these species under existing climatic conditions. The protection of the individual against bites includes the efficient screening of dwellings, the catching of mosquitos within dwellings, and the use of mosquito nets over beds. Mosquito gauze used in screening should be of the 16- or 18-mesh kind, according to the species of mosquito which is prevalent. Pure copper or bronze gauze only reduces the air space by about 35 per cent. Window screens should be fixed, and it is advisable that verandahs should be similarly protected. Openings in floors, ceilings, ventilators, etc., must be mosquito-proof, and doors should open outwards, with efficient self-closing devices. Mosquito catching is a useful measure if carried out in early morning and after sunset. Quinine is valuable in the case of persons compelled to spend some time in a malarious locality, but its power of eradicating malaria in a large territory is debatable.

Kingon (J. R. L.). **The Economics of the East Coast Fever as Illustrated by the Transkeian Territories.**—*South African Jl. Sci., Cape Town*, xii, no. 6, January 1916, pp. 213–226. [Received 9th May 1916.]

The number of cattle lost through African Coast fever in the Transkeian Territories in 1911 was estimated at 1,111,705 head, and in 1914 at 434,063 head. The financial loss incurred has been placed at five million pounds. Although the progress of the disease has been arrested to some extent, a subacute phase seems to persist, the result of which is that a very small percentage of calves outlive the first year. The numerical loss in animals affected trade, in that the transport system was completely disorganised, and this in turn increased the cost of freight and indirectly that of living. Government measures, including laws restricting the movement of cattle, the erection of barriers, dipping tanks, etc., involved an expenditure of many thousands of pounds. In discussing the effect of the loss of cattle sustained by natives, the author raises the question as to whether labour will be released for agricultural and other industries of South Africa. He considers that the Territories cannot be quite the same after this loss and that already some change has arisen in the tribal systems and customs.

Bishop (W. A.). **Two types of skin Myiasis.**—*Proc. Med. Assoc. Isthmian Canal Zone, Mount Hope*, 1916, vii, pt. 2, pp. 87–93.

Details are given of cases of myiasis caused by *Dermatobia cyaniventris* and *Chrysomyia macellaria* (screw worm). In the latter case, plugging the nostrils with cotton wool soaked in chloroform was the method adopted for expelling the larvae. In the discussion which followed, a case was reported in which 250 larvae were expelled from the nose of one patient. Screw worm infection is said to have greatly diminished in the Canal zone.

Richardson (C. H.). **A Chemotropic Response of the House-Fly** (*Musca domestica*, **L.**).—*Science, Lancaster, Pa.*, xliii, no. 1113, 28th April 1916, pp. 613–616.

This paper gives a preliminary account of experiments carried out in New Jersey to determine the response of the house-fly to certain organic and inorganic compounds which occur as products of fermentation of horse manure. In the first experiments, various compounds were exposed in wire fly-traps, the latter being placed in situations in which flies were always present, but never extremely abundant. Positive results were obtained only with ammonium hydroxide and ammonium carbonate. The flies were attracted in large numbers to ammonium carbonate, the best results being obtained when water was added to the compound, since it prevented the deposition of the less volatile ammonium acid carbonate. Since water and carbon dioxide were not attractive to flies, it was concluded that ammonia, the remaining constituent of ammonium carbonate, was the stimulating agent. The percentage of females caught in the ammonium carbonate trap amounted to 90·7. Traps baited with food materials maintained near the first experiment showed that females were especially attracted by this compound, though they were not especially abundant in that spot.

Further experiments were conducted to determine whether fresh horse manure which did not volatilise ammonia would induce oviposition and whether such manure, when again giving off ammonia, would attract the female fly. Fresh manure was treated with dilute hydrochloric acid to convert the free ammonia into the chloride, which is non-volatile at ordinary temperatures. As a result it was found that the lots which volatilised ammonia from ammonium carbonate were more than four times as attractive as untreated acidulated lots placed from 1 to 2 feet away, and 20 times more attractive than acidulated lots placed at distances of from 25 to 50 feet. In one experiment in which an acidulated manure lot stood on each side of a dish containing ammonium carbonate and water, 12 egg-masses were deposited upon the acidulated manure, while none were found in acidulated manure controls 30 feet distant. The oviposition response was roughly in an inverse ratio to the distance from the source of ammonia. Experiments with timothy chaff conducted in a similar manner showed that chaff which produced ammonia induced oviposition ; larvae were able to develop normally in this medium. Pine sawdust was less attractive and the larvae died soon after hatching. Oviposition in cotton and on filter paper occurred in the presence of combinations of ammonium carbonate and water with valerianic and butyric acids ; without these acids the response was practically wanting. The fact that some oviposition took place in distantly removed controls of the acidulated manure series showed that certain flies went a short distance from the source of ammonia in order to place their eggs in a favourable substance, or else that they were attracted by the odour of ammonia and came by chance upon the controls. A certain power of discrimination between substances valuable or useless as food for the larvae was exhibited in some cases. Butyric and valerianic acids both occur in manure and have previously been shown to increase the attraction of ethyl alcohol to *Drosophila ampelophila.*

MALLOCH (J. R.). *Triphleps insidiosus,* **Say, sucking Blood (Hem., Het.).**—*Entom. News, Philadelphia,* xxvii, no. 5, May 1916, p. 200.

The author records having been attacked by the Anthocorid bug, *Triphleps insidiosus,* Say, at the end of October in Illinois. This is apparently the first record of an attack on man by this species.

KNAB (F.). **Four European Diptera established in North America.**—*Insecutor Inscitiae Menstruus, Washington, D.C.,* iv, nos. 1–3, January to March 1916, pp. 1–4.

Hydrotaea meteorica, L., has been found on cattle in Montana and North Dakota. In the former State this species is abundant and troublesome, as it enters the eyes and ears of cattle to feed on the moisture present. *Lynchia maura,* Bigot, a common parasite of the domestic pigeon in the Mediterranean region, occurs also at Key West, Florida, in Georgia, Cuba, Brazil and Venezuela. The same species has recently appeared in Hawaii. In Florida the presence of this parasite was accompanied by a fatal disease. The Borborid, *Leptocera sylvatica,* Meig., was taken from a compost heap at Arlington, Virginia. The remaining species, *Pegomyia hyoscyami,* Panz., occurs on various food-plants.

A Fly Destroyer.—*Queensland Agric. Jl., Brisbane,* v, no. 4, April 1916, p. 220.

A mixture consisting of equal parts of casein, brown sugar and water, which has been allowed to stand for 24 hours, is stated to be a cheap and effective trap for house-flies.

Supply of Dipping Material.—*Rhodesia Agric. Jl., Salisbury,* xiii, no. 2, April 1916, pp. 178–181.

Owing to the shortage in the supply of cattle dip, arrangements have been made by the Government for the distribution of arsenite of soda for the preparation of the Natal Laboratory Dip, at the rate of 100 lb. for £2 10*s.* 0*d.* This arsenite contains about 60 per cent. arsenic, or 20 per cent. less than that generally used for preparing the dipping fluid. The following formulae are therefore given for the preparation of the three-day dip and seven-day dip respectively :—(1) 5 lb. 5 ozs. arsenite of soda, 1 gal. paraffin, 3 lb. soft soap, 400 gals. water ; (2) 10 lb. 10 oz. arsenite of soda, 2 gals. paraffin, 5½ lb. soft soap, 400 gals. water. The soap is dissolved in a sufficient quantity of hot or cold water and the paraffin is added to the solution, the whole being stirred until an emulsion is formed. A solution of the arsenite of soda is then added, and the quantity made up to 400 gals.

Sleeping Sickness.—*Rhodesia Agric. Jl., Salisbury,* xiii, no. 2, April 1916, p. 185.

Persons in search of game in the southern part of the Sebungwe district are warned of the danger of hunting in any locality west of the Sengwe and Lutope Rivers within the fly area, and especially in the valley of the Busi River.

SINCLAIR (J. M.). **Veterinary Report.**—*Rhodesia Agric. Jl., Salisbury,* xiii, no. 2, April 1916 pp. 265–268.

During January 1916 an outbreak of African Coast fever occurred in the Mazoe District. Trypanosomiasis was present among pigs on two farms on the Umfuli River, under conditions which point to infection by vectors other than tsetse fly [*Glossina morsitans*]. Preliminary experiments with this form of the disease have been carried out and arrangements made for the regular dipping of the remaining pigs in an arsenical solution. In February, one case of African Coast fever was recorded in the Mazoe District in a herd not previously infected, but running on the same infected veld near the dipping tank, and fresh outbreaks occurred in the Melsetter District. An undetermined skin disease among cattle in the Wankie District may have been due to *Amblyomma variegatum* (bont tick), which occurs in that area.

ELTRINGHAM (H.). **Some experiments on the House-fly in Relation to the Farm Manure Heap.**—*Jl. Agric. Sci., Cambridge,* vii, pt. 4, pp. 443–457, April 1916, 3 figs. [Received 31st May 1916.]

The object of these experiments was to test the fly breeding capacity of the farm manure heap in the open as distinguished from heaps close to dwellings and to ascertain how far it is true that all manure heaps, wherever placed, breed flies. Six experimental heaps were established, three close to the laboratory buildings at Rothamsted and three others about 33 yards from these buildings and 74 yards from the nearest cottages and about a quarter of a mile from the main street of the village of Harpenden. A rectangular trench 1 foot deep and 18 inches wide was dug round the area on which the heaps were to be placed and lined with boards. This trench was then filled in to ground level with loose earth and old manure straw forming a light mass suitable for the pupation of the larvae. A wooden frame 1 foot deep and 5 feet square was placed on the inner side of the trench to serve as a container for the manure. The trenches and the manure heap were covered with unbleached cheese cloth on frames and wire balloon traps, fitted with a sliding arrangement to render removal and replacement easy, were fixed to the manure heap cover and to the trench covers. A barrow load of horse manure from neighbouring army stables was placed on each heap daily for a fortnight and the heap then covered in ; 23 days later the heap was cleared away. The following flies were caught—*Eristalis tenax*, L., 1 ; *Musca domestica*, L., 3 ; *Stomoxys calcitrans*, L., 5 ; *Fannia canicularis*, L., 1 ; *Chortophila cilicrura*, Rnd., 4 ; *Hydrotaea armipes*, F., 2 In another experiment manure was obtained from a stable closely surrounded by houses and near to a bakery, in 13 days the following flies were captured :—*M. domestica*, L., 798 ; *S. calcitrans*, L., 31 ; *C. cilicrura*, Rnd., 22 ; *F. canicularis*, L., 4 ; *H. armipes*, F., 10. Over 85 per cent. of *Musca domestica* hatched from the heap and the remainder from the trenches. Another heap of well trodden, mixed cow and horse manure from a farm yielded in 23 days :—*E. tenax*, L., 8 ; *S. calcitrans*, L., 8 ; *Sargus cuprarius*, L., 15 ; *Chrysomyza demandata*, F., 2 ; *F. canicularis*, L., 6 ; *C. cilicrura*, Rnd., 9 ; and a similar heap (not trodden) at the laboratory produced :—*E. tenax*, 13 ; *S. calcitrans*, L., 9 ; *C. cilicrura*, Rnd., 14 ; *Scatophaga* *stercoraria*, L., 4; *Sargus cuprarius*, L., 4; *F. canicularis*, L., 3; the total absence of *Musca domestica* being again noticeable. Another heap of manure, not compacted, near farm buildings and about a mile from the laboratory, yielded :—*Ophyra leucostoma*, Wd., 36; *S. calcitrans*, L., 4; *S. cuprarius*, L., 13; *C. cilicrura*, Rnd., 37; *C. demandata*, F., 6; *F. canicularis*, L., 3. A small heap of mixed garden and kitchen refuse and some fowl dung close to the laboratory yielded :—*Muscina stabulans*, Fln., 13; *F. canicularis*, L., 17; *C. cilicrura*, Rnd., 13; *O. leucostoma*, Wd., 4. In a large manure shed, the floor of which was a cement tank 12 inches deep and with an area of 660 square feet, a portion of the contents, 25 square feet in area, was covered and, though possibly some flies escaped, 453 were taken in 10 days and these nearly all *Muscina stabulans*; at this rate the manure shed might have produced 1,200 flies per diem; only three *Musca domestica* were taken.

Records of a number of other similar experiments are given and the following general conclusions were reached: The house-fly will breed in large numbers in stable refuse stored close to dwellings, the controlling factor being the dwellings rather than the stable refuse, the latter providing a breeding place for flies visiting the house in search of food; the open, farm manure-heap far from houses is but little frequented by house-flies; spent heaps under rural conditions produce practically no flies at all; the farm heaps though producing hardly any house-flies are a prolific source of *Stomoxys calcitrans* and for the protection of farm animals all such heaps should be specially treated; when the farm dwellings and buildings adjoin one another, the danger is even greater especially if dairies and other food-preparing departments are in proximity to farm refuse. Town manure heaps should be far more strictly regulated than at present. In addition to *S. calcitrans* which, though regarded as chiefly a pest of horses, is a serious pest of man, *Musca autumnalis*, De G., is a great nuisance in houses, entering attics and disused apartments in enormous numbers in autumn. So called hibernating house-flies are almost invariably of this species. No difficulty was found in breeding this fly from cattle dung found in fields.

CARTER (H. F.). **On Three New African Midges.**—*Ann. Trop. Med. Parasit., Liverpool*, x, no. 1, 29th April 1916, pp. 131–138, 1 fig., 1 plate.

The new species described are *Forcipomyia lefanui*, from the Gold Coast and *Culicoides cordiformitarsus* and *C. stephensi*, from Cairo.

CARTER (H. R.). **Immunity to Yellow Fever.**—*Ann. Trop. Med. Parasit., Liverpool*, x, no. 1, 29th April 1916, pp. 153–164.

In countries in which yellow fever is epidemic the view is held that permanent immunity is conferred by an attack; in endemic foci, on the other hand, it is believed that subsequent attacks are common. Evidence for the permanence of immunity should be most abundant in places in which yellow fever occurs in epidemics; this evidence would rarely be satisfactory to those holding a contrary view, because the belief of physicians in such places that this immunity is permanent would render them little apt to recognise secondary attacks unless they were well marked, which would rarely be the case. Between 1888 and 1898 more than 30,000 persons certified as protected from yellow fever by previous attack or by 10 years residence in an infected focus entered the towns of Key West and Tampa in Florida from Havana. These towns were full of *Stegomyia fasciata* (*Aëdes calopus*) and persons susceptible to yellow fever, while fever prevailed in Havana during this time. As no yellow fever developed in Florida, there should have been no considerable number of secondary attacks which could infect *S. fasciata* among these people. That yellow fever could be readily contracted from Havana by those susceptible to it, is shown by the fact that during this time 450 persons from Havana, not certified as immune, yielded 13 cases of yellow fever at a quarantine station. This is evidence that yellow fever carriers are not so common as is frequently supposed, as is also the fact that the quarantine stations of the United States have for many years passed in a large number of people from yellow fever ports with no evidence of their having infected *S. fasciata* in the United States.

CLELAND (J. B.). **The Stomach Contents of Australian Birds.**—*Agric. Gaz. N.S.W., Sydney*, xxvii, no. 4, April 1916, pp. 263–269.

An examination of the stomach contents of 1,150 individuals, comprising 224 species of birds living in a wild state in Australia, has been made. The full data will be published as a Science Bulletin, but in the present paper detailed summaries and verdicts on individual birds or groups of birds are given together with a broad summary of results, especially from the point of view of the blow-fly pest in sheep.

Sparrows and starlings, though useful to a slight extent, do much more harm than good. There is not the slightest prospect of their ever being eliminated from Australia and instead of being fostered, most energetic means should be adopted to ensure their destruction where necessary. Crows, whilst doing marked harm at times, undoubtedly are on other occasions of decided value. By destroying dead carcases this bird tends to prevent the multiplication of blowflies. Before any sheep-owner decides to destroy it in his neighbourhood, he should calculate carefully whether its value in his particular instance is not greater than the losses caused by it. Of the large number of other birds examined, with the exception of one or two notorious exceptions, the vast majority serve a more or less definite useful purpose in maintaining the balance of nature as regards the various species of insects and should therefore be encouraged. Only a few have however been found to feed on blow-flies.

JOJOT (C.). **Note sur la lutte contre la maladie du sommeil au Cameroun 1913-1914.** [Note on the struggle against sleeping sickness in Kamerun in 1913–1914.]—*Bull. Soc. Path. Exot., Paris*, ix no. 5, 1916, 10th May 1916, pp. 303–305.

Between 1907 and 1910 important measures against sleeping sickness were carried out in Kamerun. The disease existed in a sporadic state in that part of the colony situated to the north-east of the Sanaga and the western Logone rivers and two dangerous foci were present to the south-east of this line. On the acquisition of the basin of the Upper Sangha by Germany in 1911, fears were entertained for the reinfection of the old colony, since a centre of infection had been shown to exist in the new territory. As a result, the struggle against sleeping sickness received a new impulse; the new territories were declared contaminated and the recruiting of carriers or native labourers in the old colony for the Upper Sangha was forbidden. A commission was appointed in 1913 and carried out the following measures:—(1) The injection of persons in infected villages with atoxyl, arseno-benzol, etc.; (2) the formation of clearings in the neighbourhood of infected districts; (3) the prohibition of passage from infected areas without special permission; this rule was rigorously enforced in the Aba-Berberati-Bula triangle, where the disease was very prevalent. The outbreak of war has resulted in the movement of natives and troops throughout the region, thus reversing the last regulation.

Sheep Lice.—*Internat. Rev. Sci. & Pract. Agric., Rome*, vii, no. 1, January 1916, p. 101. [Abstract from *The Pastoral Review, Melbourne*, xxv, no. 9, 16th September 1915, pp. 854–855, figs.] Received 2nd May 1916.]

Sheep lice belong to the following species:—*Haematopinus ovillus*, *H. pedalis* (*H. macrocephalus*), found in the United States and *Trichodectes sphaerocephalus*. The first named was discovered in New Zealand in 1906; the second was reported for the first time in Australasia in the South Island, New Zealand. As insecticidal sheep dips have been used for a long time in New Zealand, these insects have not caused much injury. These two species suck blood from their host, causing weakness and reduced production of wool. *T. sphaerocephalus* is still more injurious, it does not suck but feeds on the epidermis and on the wool. It is so prolific that in a short time one ram bearing lice will infect a whole flock. On account of the drought in 1915, the Australian shepherds were compelled to graze their flocks even in the lice-infected districts and to mix immune with infected flocks, which has caused a rapid spread of the parasite. The loss of wool due to lice in South Australia was estimated to amount to £100,000 in 1914 and to a much greater sum in 1915, in which year the parasite occurred over a much larger area than in preceding years. The ova of the lice, being surrounded by a fatty matter, are not reached by insecticides, hence the necessity for two dips; one after shearing, and the other within sixty days, that is, before the lice hatched from the ova which survived the first dip, begin to oviposit. Dips containing poisons are considered by Mr. F. H. Williams to be the only ones which are effective in protecting sheep against infection.

Macfie (J. W. S.) & Ingram (A.). **New Culicine Larvae from the Gold Coast.**—*Bull. Entom. Research, London*, vii, no. 1, May 1916, pp. 1–18, 14 figs.

The mosquito larvae described and figured in this paper were collected at Accra and at Sunyani in Ashanti. Larvae of *Stegomyia metallica*, Edw., were found in clear but dark brown water in the hollow of a tree. Specimens of *Culiciomyia nebulosa* and *S. unilineata* were also present.

This strain of *S. metallica* was maintained in the laboratory for seven months without any visible effects resulting from the close inbreeding. Isolated pairs did not breed rapidly; the females fed reluctantly and eggs were deposited at irregular intervals. The larvae were able to develop both in a highly nitrogenous, dark brown medium, or in tap water with a layer of sand at the bottom. The duration of the developmental stages was as follows:—Egg, seven days; larval, ten days; pupa, three days. *Stegomyia luteocephala*, Newst., was found in the gutters of two bungalows at Accra; the water was slightly turbid and contained decaying vegetable matter. *Ochlerotatus irritans*, Theo., occurred in small pools near the lagoon at Accra; the water contained about 2·2 per cent. of salt. *O. sudanensis*, Theo., together with larvae of *Anopheles costalis*, *Culex insignis* and *Uranotaenia annulata*, was found in crab holes along the sides of the stream at Sunyani; the water always contained much suspended matter. *Culex pruina*, Theo., and *Eretmopodites inornatus* were present in water containing decaying vegetable matter, found in a hollow in the concrete foundation for the erection of a pump. *Culex insignis*, Cart., occurred in crab holes containing water with much suspended matter. *C. ingrami*, Edw., was found in deep clear pools in the thick forest. *C. consimilis*, Newst., was present in masses of filmy algae in clear water. Larvae and pupae of *Eumelanomyia inconspicuosa*, Theo., occurred in clear water in the hollow of a fallen tree. *Mimomyia hispida*, Theo., together with larvae of *M. plumosa* and *Uranotaenia alboabdominalis*, was found in marshy ground along the edge of the stream at Sunyani., The position of these species in Edwards' "Revised Keys to the known larvae of African CULICINAE" (*Bull. Entom. Research*, iii, pp. 373–385) is indicated as far as possible.

JOHNSTON (J. E. L.). **A Summary of an Entomological Survey of Kaduna District, Northern Nigeria.**—*Bull. Entom. Research, London*, vii, no. 1, May 1916, pp. 19–28, 2 figs., 2 tables.

This paper describes an entomological survey of the Kaduna District and the site of the future capital of Nigeria. Special attention was paid to the presence of *Glossina* and the resulting trypanosome diseases of cattle. Tsetse-flies were very scarce in the district, possibly owing to the dry season, though a few examples of *Glossina palpalis* and *G. tachinoides* were obtained. *Stomoxys* spp., especially *S. nigra* and *S. calcitrans*, were abundant. Though it has been shown that *Trypanosoma nigeriense* will develop in the gut of *S. nigra*, it is more probable that cattle were infected by *Glossina* near the streams. Of the total number of cattle examined, 12·6 per cent. were infected with trypanosomes and 26 per cent. with piroplasmata, while one sheep out of 12 examined showed piroplasmata. The trypanosome causing infection was mostly of the *T. vivax* type.

The commonest mosquito was *C. nebulosa* (51·85 per cent.), while *Anopheles costalis* and *Culex duttoni* ranked second (14·19 per cent.). The remaining 19·7 per cent. consisted of:—*Stegomyia fasciata*, *S. simpsoni*, *S. sugens*, *S. africana*, *Culex decens*, *C. fatigans*, *C. tigripes*, *C. annulioris*, *Ochlerotatus cumminsi*, and *Mansonioides uniformis*. Other blood-sucking flies and ticks collected, included:—TABANIDAE: *Haematopota gracilis*, Aust.; *H. lacessens*, Aust.; *H. pertinens*, Aust.; *H. puniens*, Aust.; *H. vittata*, Lw., besides three species unidentified; *Tabanus albipalpus*, Wlk.; *T. fasciatus*, F.; *T. billingtoni*, Newst.; *T. secedens*, Walk.; *T. socialis*, Walk.; *T. taeniola*, P. de B. MUSCIDAE: *Stomoxys calcitrans*, L.; *S. nigra*, Macq.; *S. omega*, Newst.; *Philaematomyia* sp. HIPPOBOSCIDAE: *Hippobosca maculata*, Leach. IXODIDAE: *Boophilus annulatus*, Say; *Haemaphysalis leachi*, Aud.; *Amblyomma variegatum*, F.; *Hyalomma aegyptium*, L.

LAMBORN (W. A.). **Third Report on *Glossina* Investigations in Nyasaland.**—*Bull. Entom. Research, London*, vii, no. 1, May 1916, pp. 29–50.

The survey of the distribution of *Glossina morsitans* in the proclaimed area, especially in the neighbourhood of Rifu and Kuti, was completed by 6th August 1915, when a return was made to the vicinity of Monkey Bay in order to establish artificial breeding places on a large scale. In the centres at Rifu and Kuti, the fly was not found to be localised sufficiently to render feasible any attempt to control it by clearing the bush, as had previously been suggested. [See this *Review*, Ser. B, ii, p. 96.] At Rifu, pupae were found in greater numbers under the shelter of dead trees than under cover of rocks. Breeding was found to be at a minimum during the late dry season.

The parasite, *Mutilla glossinae*, Turn., was reared in large numbers from pupae obtained near Monkey Bay. *M. glossinae* is to be regarded as a primary parasite, depositing eggs in *Glossina* pupae at varying stages of development. No evidence has yet been obtained that *G. brevipalpis* is attacked by this species of *Mutilla* under natural conditions. The duration of the life-cycle within the tsetse-fly pupa varies very considerably, and may be influenced by climatic changes. In one individual reared from a *G. brevipalpis* pupa, development occupied nearly 12½ weeks, while in other specimens, the developmental period was extended to 17 weeks. The numbers of *M. glossinae* and other parasites emerging from pupae increase rapidly in the dry season; out of 762 pupae obtained from natural breeding places between 22nd August and 16th October, 97 flies and 131 Mutillids emerged. From 368 pupae collected within the proclaimed area, only two parasites, a Mutillid and a Bombyliid, were reared. A second Mutillid parasite, *M. benefactrix*, sp. n., was obtained from pupae collected at Monkey Bay. This species showed greater activity than *M. glossinae* and differed in the method of pairing.

Experimental evidence showed that the Chalcid, *Syntomosphyrum glossinae*, Wtrst., is hyperparasitic on *M. glossinae*. The latter may be attacked in both larval and pupal stages. About 3 per cent. of the pupa cases of *M. glossinae* examined between 7th April and 2nd June showed evidence of parasitism, while between 22nd August and 16th October less than 1 per cent. were parasitised. Observations are being carried out relative to the action of *S. glossinae* on *M. benefactrix*. A second hyperparasite of *M. glossinae*, namely, *Eupelminus tarsatus*, was obtained from pupae of *G. morsitans* collected at Monkey Bay.*

---

* There is reason to suppose that this insect is more likely to be a primary parasite rather than a hyperparasite.—ED.

In captivity, pairing took place soon after emergence and oviposition began about two hours later in pupae believed to be parasitised by *M. glossinae.* Nine females oviposited in pupae of *G. morsitans*, the cocoon of *M. glossinae* being present in every case except one; 22 males and 58 females emerged. In those instances in which definite data were obtained, the period between oviposition and emergence varied from 28 to 32 days, the greatest number obtained from a single puparium being nine. In several cases Mutillids emerged from pupae into which *E. tarsatus* had inserted its ovipositor and in two cases tsetse-flies emerged from such pupae. A few large Chalcids, *Stomatoceras* spp., were obtained from pupae found in the neighbourhood of Monkey Bay between 7th April and 2nd June, but were absent from pupae in the proclaimed area. These Chalcids may be hyperparasite of *M. glossinae,* since specimens of the latter were present in some cases, but more probably are primary parasites of *Glossina* which develop more rapidly than *M. glossinae* and may incidentally attack the larva of this species.

In considering the relation between tsetse-flies and the larger animals, it has been observed that an abundance of flies is correlated with the actual or recent presence of game in any given area. The high development of the sense organs connected with the antennae renders the fly able to detect its food from a long distance. A meal is required every five or six days, hence the presence of a large number of game animals is not essential. Part of the food is derived from baboons which occur in all districts in which the fly has been studied. Bare-necked birds, such as vultures, may furnish food material to a slight extent, but the presence of feathers in other forms is believed to render feeding very difficult. The scarcity of reptiles appears to negative the supposition that these animals may furnish a blood supply. Small LACERTIDAE are probably too active to be of material value as a source of food. Tests with toads and tree-frogs gave negative results. It is however pointed out in an editorial note that the evidence that *G. morsitans* does not normally feed on non-mammalian blood is less conclusive than would appear from these statements. The preference of *G. palpalis* for reptilian blood under natural conditions is also noted. This preference is contrary to laboratory results, which cannot therefore be relied upon in considering the natural food of these flies.

Artificial breeding places have been constructed at Rifu, in the proclaimed area and near Monkey Bay, the object being to determine which trees are most favoured as resting-places. Various species of trees were felled and in some of the breeding places the natural soil was replaced by soil from natural breeding places; in others the earth was mixed with fragments of rotting wood and bark, with earth from termitaria and with antelope droppings. Natural breeding places in both these areas were eliminated. The effect of bush fires on the distribution of the fly in certain districts in the proclaimed area was observed. A marked decrease in numbers was noted in the burnt area, but pupae sufficient to repopulate the same were found under logs untouched by the fires. Flies were abundant in a neighbouring district and this abundance was undoubtedly the result of the fire and the driving away of the game. Systematic burning of grass is not likely to be of material value in controlling the fly, as it only occurs in patches over much of the fly country, and the fires therefore fail to spread.

Wart-hogs remain in the burnt areas, feeding on roots, and thus probably furnish a source of food for newly-emerged flies.

In studying the proportion of sexes among captured flies, it was observed that male flies become attached to possible hosts in order to secure females which come to feed. When the possible hosts rest, the females are less attracted and most of the males fly off. Pairing is attempted by the male whatever may be the stage of development of the female. Collectors can readily obtain flies by catching them off each other and these captures always show a small proportion of females. If flies which have settled near the possible host are included, the results show a much higher percentage of females. The number of active *G. morsitans* decreases during the hottest part of the day. Examination of possible sheltering places during this period showed that large numbers of females are to be found in recesses in the trunk and bark of large trees, especially baobabs, while the males occur in more exposed positions. The proportion of females taken in the ordinary way in morning and evening was 12 and 10 per cent. respectively ; when taken at mid-day, mostly off trees, the proportion was 43·5 per cent. The following explanation is suggested for the variations observed in the proportion of males and females captured at different times of the day :—Males which have recently fed, attend man to await the females which come to feed. The female may be secured by a male, or if pregnant, may be driven off, and attempt to feed later. After feeding, the female retires under cover of large trees or to breeding places to protect itself from the males. It is almost certain that the sexes exist in the same area in equal numbers. Attempts to control the fly by systematic capture would be most successful if the flies were taken off the trees at mid-day. Breeding was apparently at its maximum at the time of investigation, i.e. in October 1915 ; the pupal period averaged 21 days, as against 10 weeks in the dry season. The same shortening of the developmental period was observed in the case of *Mutilla glossinae, E. tarsatus* and *Stomatoceras*.

In September 1915, a large area of territory in Nyasaland was thrown open for free shooting in the belief that this measure would reduce the tsetse-flies. The author is of the opinion that the desired result cannot be obtained in this way, because the fly-area is continuous with areas in North-Eastern Rhodesia, and the game may retire to Rhodesia during the dry season, returning with the rains and bringing an abundance of flies with it.

In a supplementary report, further observations are made on the resting habits of *G. morsitans*, on artificial breeding places, and on parasites. Baobab trees were found to be preferred as resting places, though any large trees were suitable. Birdlime traps placed in recesses of the trees did not prove effective in capturing flies. Numerous artificial breeding places were successfully established. At Rifu, where 10 species of trees had been felled, no one of them was apparently preferred. The results indicate the possiblity of checking the fly by the establishment of artificial breeding places ; at Lingadzi the results almost suggested that control could be carried out by eliminating only the larger natural breeding places. This method might be used over small areas, such as those in the vicinity of main roads and important centres. The possibilities of the transfer of flies by moving game across clearings from which natural breeding places had been removed might be prevented by means of a wire fence. *G. palpalis* is known to have been spread by the railway in south Nigeria, and therefore this method of control may be required when the projected railway from Blantyre is carried north through the fly area. Another method of control which might be effective would be the destruction of large trees in the fly area. These however are few, and could more suitably be used in providing artificial breeding places.

Though a number of Mutillids were obtained from sandy soil, *M. glossinae* was not amongst them. Three female *M. glossinae*, emerging from *G. morsitans* pupae on 5th, 11th and 19th October, were paired with a male on the day of emergence, oviposited in *G. morsitans* pupae and adults emerged between 7th and 11th, 8th and 20th, and 19th and 24th December respectively. The Bombyliid, *Thyridanthrax abruptus*, Lw., proved to be a primary parasite of *G. morsitans* pupae. Eggs deposited in pupae between 7th and 4th November emerged as adults between 20th and 24th December. Some of the adults fed freely and lived for a week.

MacGregor (M. E.). **Resistance of the Eggs of** *Stegomyia fasciata* (*Aëdes calopus*) **to Conditions adverse to Development.**—*Bull. Entom. Research, London*, vii, no. 1, May 1916, pp. 81–85, 3 figs.

Several generations of *Stegomyia fasciata* were reared from eggs obtained in April 1915 from West Africa. These had been in a dried condition for at least 3½ months. [See this *Review*, Ser. B, iii, p. 187.] Under the breeding methods adopted, it was found that the eggs of succeeding generations were very liable to destruction by desiccation and therefore differed in some way from those originally received. The two alternatives suggested were :—(1) that the eggs when laid were protected by some substance in the shell which was soluble in or destroyed by water and that only eggs laid out of water were able to resist desiccation ; (2) that the egg must remain in water for some time and the embryo be partly developed before the shell was rendered resistant. Eggs deposited on slightly moist leaves collapsed in a very short time and thus negatived the first supposition. Those allowed to remain in water for 60 hours or more, showed no alteration when removed for 12 hours. Prolonged contact with water is therefore necessary to promote resistance to desiccation. Embryos of freshly laid eggs are easily killed by drying, while experiment showed that eggs removed from water 3½ days after oviposition were able to hatch after exposure for one hour to the condensed beam of an electric arc light.

Turner (R. E.). **On Mutillidae parasitic on** *Glossina morsitans*.—*Bull. Entom. Research, London*, vii, no. 1, May 1916, pp. 93–95, 2 figs.

Descriptions are given of *Mutilla glossinae*, Turner, and *M. benefactrix*, sp. n., reared from pupae of *Glossina morsitans* collected at Monkey Bay, Nyasaland.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.

The Connection between Tabanids and Anthrax in China .. 101
The Capture of *Anopheles maculipennis* in Paris 101
Spirochaetosis of Fowls in Russian Turkestan 101
The Susceptibility of the Flying-Fox to African Trypanosomes .. 101
The Bionomics of *Choeromyia* spp. in West Africa 101
A Myriapod living in the nasal Cavity of Man in France 102
Flies hibernating in Houses in Scotland 102
The Relations between Leishmaniasis and Biting Insects .. 102
The Disadvantages of using Benzine against Lice 104
The Relations between Mosquitos and Malaria 104
The Economic Effects of East Coast Fever in South Africa .. 105
Myiasis in Man in the Panama Canal Zone 105
Experiments with Substances attractive to *Musca domestica* in the U.S.A. 106
Triphleps insidiosus attacking Man in the U.S.A. 107
Noxious European Flies established in North America 107
Casein as a Bait for House-flies 107
The Use of Sodium Arsenite in Cattle Dips in Rhodesia 107
Warnings against Fly Areas in Rhodesia 107
East Coast Fever and other Stock Diseases in Rhodesia 108
The Relations of House-flies and Farm Manure Heaps in Britain.. 108
New African Midges 109
Immunity to Yellow Fever in Florida 109
The Value of Birds in destroying Blow-Flies in Australia 110
Measures against Sleeping Sickness in Kamerun 110
Lice infesting Sheep in Australia and New Zealand 111
New Culicine Larvae from the Gold Coast 111
An Entomological Survey of Kaduna District, Northern Nigeria.. 112
The Bionomics of *Glossina morsitans* in Nyasaland 113
Resistance of the Eggs of *Stegomyia fasciata* to adverse Conditions 116
Mutillids parasitic on *Glossina morsitans* 116

VOL. IV. Ser. B. Part 8.—pp. 117-131. AUGUST, 1916.

Smithsonian Institution
SEP 26 1916
National Museum.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON.
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., ***Chairman.***

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.

Mr. E. E. Austen, Entomological Department, British Museum (Natural History).

Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.

Mr. E. C. Blech, C.M.G., Foreign Office.

Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.

Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.

Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.

Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).

Professor H. Maxwell Lefroy, Imperial College of Science and Technology.

The Hon. Sir John McCall, M.D., Agent-General for Tasmania.

Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.

Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.

Sir Patrick Manson. G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.

Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.

Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.

Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.

Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.

Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.

Mr. H. J. Read, C.B., C.M.G., Colonial Office.

The Honourable N. C. Rothschild.

Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.

Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.

Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.

Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.

Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.

Dr. Guy A. K. Marshall.

Assistant Director.
Mr. S. A. Neave.

Assistant Editor.
Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.

Publication Office.—27, Elvaston Place, London, S.W.

Smithsonian Institution SEP 26 National Museum

Lloyd (Ll.). **Report on the Investigation into the Bionomics of** *Glossina morsitans* **in Northern Rhodesia, 1915.**—*Bull. Entom. Research, London*, vii, no. 1, May 1916, pp. 67–79, 2 figs., 1 plate, 3 tables.

In the Kashitu area, *Glossina morsitans* appears to be numerous and troublesome although game is relatively scarce. Collections of pupae, however, have shown that the apparent abundance is due to the fact that on account of the restlessness of the animals, flies of both sexes swarm round persons passing through the area and feed readily. In the same area female flies were caught in relatively much greater numbers than at Nawalia and Ngoa. Game in the last-named area is plentiful and the number of pupae collected was four times as great as in the Kashitu area. Hence it may be deduced that pupae, and therefore flies, are more numerous in districts in which game is plentiful. Certain districts in the Ngoa area were investigated; the conditions as regards the relation between the game, pupae and hunger of the fly were found to be similar to those observed in the Kashitu area. Man was frequently attacked where game was scarce or non-resident, while flies were rarely seen where game was plentiful. If the game were reduced to a minimum, so that the fly was attracted to man, the fly might be destroyed by means of nets in very limited areas. The reduction of game in a fly area would lead at first to an apparent increase in the numbers of the fly, owing to increased hunger; the number of females in a capture would increase to about 50 per cent., while pupae would occur in fewer numbers, thus showing that an actual reduction had taken place. The increase in the number of females in a capture would be important if netting were used as a means of control. Collections of pupae from burnt areas showed that about 12 per cent. were dead at the time of collecting. This record was made a considerable time after the fires, hence it was not an accurate estimate of the proportion destroyed. All the breeding places examined showed the presence of a dark hiding place for the flies, and were of the type met with in other fly areas. Exceptions occurred near the Lukanga River, in the thin mopani forest and in the bed of the Bwobwa stream in Chutika. These three breeding places were such as to show that it is improbable that pregnant females are influenced by any special odour, such as that of humus. A single pupa of *G. brevipalpis* was found in the sandy bed of the Bwobwa stream, together with *G. morsitans*, beneath a large fallen tree.

Six species of insect parasites of the pupae of *G. morsitans* were found. *Mutilla glossinae*, Turner, is generally distributed in *G. morsitans* areas in north Rhodesia. The duration of the pupal period was observed to be 45 days. Adults in captivity fed readily on jam; the females lived about three weeks and the males from 10 to 14 days. Attempts to breed them were unsuccessful. The percentage of parasitism by *M. glossinae* at Chutika was on an average 7 per cent.; parasites emerged between 15th August and 6th October from pupae collected during July. At Nawalia, the parasitism reached 13 per cent., a quarter of the parasites being males. Emergence from pupae collected on 21st and 23rd August took place between 25th September and 26th October. Attempts to breed *Anastatus viridiceps*, Wtrst., in captivity, failed. *Stomatoceras micans*, Wtrst., occurs at Mwengwa and Ngoa.

(C286) Wt.P1/106. 1,500. 8.16. B.&F.Ltd. **Gp.11/3.** A

In one case an almost fully developed tsetse-fly emerged from a puparium parasitised by this species. *Syntomosphyrum glossinae*, Wtrst., has been met with at Mwengwa, Ngoa and Kashitu and probably occurs in the Luangwa Valley. The insect was taken from September to November; about 25 usually emerged from one puparium. Among the Dipterous parasites of *G. morsitans*, two Bombyliids, *Villa lloydi*, Aust., and probably *Thyridanthrax abruptus*, Lw., were obtained from Ngoa and Chutika respectively. The first species was collected in September and flies emerged during the same month. The second species was taken in July and adults appeared in August.

A record of *G. morsitans* feeding on avian blood was obtained at Kashitu when two flies were seen on the bare skin of the neck of a ground hornbill, one being in the act of sucking blood. In three instances flies feeding on rabbits were observed to be engorged with a clear fluid instead of blood; this may have been serous fluid obtained by piercing the body wall.

Cases of sleeping sickness in the Luangwa Valley were partly scattered and partly centred around the villages of Chinunda, Chutika, Chewanda and Kakumbi. The first two and the last of these contain food, shade, and potential breeding places of the fly. Natives passing through the villages are liable to come into contact with shady places in which the flies are resting, and an infected fly brought into this type of village could remain long enough to infect several persons. *G. morsitans* probably requires the blood of domestic animals in addition to that of man, and as domestic animals are present in these villages, the fly might be able to breed there. Epidemics of disease occur in shady and scattered villages; hence these epidemics could probable be prevented by rendering the villages compact and by removing shade. The clearing of bush round water-holes is a more difficult matter, as the water would fail if the shade were removed.

ANNANDALE (N.) & KEMP (S.). **Fauna of the Chilka Lake:—Aquatic and Marginal Insects.**—*Memoirs of Indian Museum, Calcutta*, v, pp. 177–188, 1 plate, 3 figs.

It is probable that several species of Chironomids breed in the lake itself and *Culicoides peregrinus*, Kieff., is very common at Barkul in July and September, breeding in small pools near the edges. Another species allied to *Palpomyia polysticta*, Kieff., is found in the lake itself and seems to be distinct from any of those described from India. With regard to CULICIDAE, Major A. B. Fry stated in 1911 that the vast perennial mosquito population of the villages on the lake comes from the lake itself and, where weeds and algae offer protection from the attacks of fish, Anopheline larvae and nymphs swarm, chiefly those of *Anopheles rossi* and *A. fuliginosus*, though *A. listoni*, *A. fowleri*, and *A. sinensis* (*nigerrimus*) were also present. The authors only found larvae of *A. rossi* in the lake and these were abundant in brackish water off Barkul in February and July. The absence of *A. ludlowi* is considered remarkable, as it is the common Anopheline of brackish water near Calcutta. The opinion is expressed that most of the mosquitos breed in the small pools near the edge rather than in the lake itself.

Herms (W. B.). **The Pajaroello Tick (*Ornithodorus coriaceus*, Koch), with special reference to life-history and biting habits.**—*Jl. of Parasitology, Urbana, Ill.*, ii, no. 3, March 1916, pp. 137–142, 1 fig.

The venomous Pajaroello tick is much feared in the mountainous portions of Santa Clara and San Benito Counties, California. The accounts all agree in the essential detail that the bite results in an irritating lesion which is slow to heal and often leaves an ugly deep scar. In August 1913, living specimens taken near Mount Hamilton were identified as *Ornithodorus coriaceus*, Koch, described in 1844 from a single female specimen from Mexico, which is probably the original habitat. This Argasid superficially resembles *O. moubata*, Murray, which transmits relapsing fever in Africa. Since August 1913, its complete life-history has been worked out. The larvae from 323 ova, deposited by one female on 9th March 1914, hatched in about 21 days at a temperature averaging 79° Fahr. They were placed on the ear of a rabbit on 2nd May, and, among others, one was recovered fully engorged on 11th May. Its first moult occurred on 21st May, giving about 51 days for the larval stage in this instance. The second moult, without a second engorgement, took place on 15th June. The nymph became fully engorged in about twenty minutes on 2nd July, the third moult occurring on 12th August. Becoming fully engorged again on 11th October, the fourth moult took place on 23rd December. Engorging again on 16th January 1915, the fifth moult took place 9th March and the mature tick, a female, appeared. On 27th March it became fully engorged on a mouse and was placed with a male on 16th April, pairing taking place on 17th April. The first oviposition consisting of 428 eggs took place on 10th June 1915. Thus the period from egg to egg in this individual covered exactly fifteen months. This time may be reduced very considerably by applying the ticks to a suitable host at shorter intervals and in the case of one male sexual differentiation was accomplished in 159 days, as against 343 days in the above instance. Under natural conditions it seems quite probable that there is one generation each year and that two years may be necessary in many instances. Although the incubation period at a given sustained temperature suffers little variation, *e.g.*, at 79° Fahr. it is 21 days, the length of time required for the other stages varies considerably. The minimum length of the larval period was found to be 19 days. The number of moults varies from four to seven. The length of time a female may remain fertile without further pairing is at least two years. No little difficulty was experienced in rearing this tick. The ear of a rabbit is best suited for feeding the larval stages; later stages are best fed by placing the ticks either on a rabbit or on a mouse, holding these until the fully engorged ticks drop off, this process requiring from 15 to 20 minutes. The venomous nature of the bite of this tick as affecting man, monkey (*Macacus rhesus*), rabbit and mouse is described. In the animals the injury did not prove severe. A detailed account of two bites suffered by Mr. W. L. Chandler is given. Considerable irritation and swelling was produced and for several weeks both lesions exuded a clear lymph from beneath a scab, which remained in evidence for two or three months. Mr. Chandler reported these ticks as very numerous in some localities. Their presence and number seemed to be determined by that of cattle. Ticks were also found where there were no cattle, but in places which were evidently the favourite haunts of wild animals.

KELLOGG (V. L.) & FERRIS (G. F.). **Anoplura and Mallophaga from Zululand.**—*Ann. Durban Mus., Durban*, i, no. 2, 15th May 1915, pp. 147–158, 2 plates. [Received 5th June 1916.]

The Anoplura recorded include :—*Polyplax otomydis*, Cummings, from *Otomys irroratus* ; *P. jonesi*, sp. n., from *Saccostomus campestris* ; *Hoplopleura intermedia*, sp. n., from *Mus coucha* ? and *H. enormis*, sp. n., from *Arvicanthis dorsalis*.

EDWARDS (F. W.). **An Annotated List of Mosquitos occurring at Durban, Natal.**—*Ann. Durban Mus., Durban*, i, no. 2, 15th May 1915, pp. 160–166. [Received 5th June 1916.]

The following species of mosquitos are recorded :—*Anopheles mauritianus*, Grp., not frequenting houses and not known to be a carrier of malaria ; *Toxorhynchites brevipalpis*, Theo., a beneficial species, widely distributed in Africa, its larva feeding on the larvae of other mosquitos ; *Banksinella lineatopennis*, Ludl., occurring throughout the Ethiopian region and from India to the Malay States and Philippine Islands ; *B. luteolateralis*, Theo. ; *B. luteolateralis*, Theo., var. *flavinervis*, Edw. ; *Armigeres argenteoventralis*, Theo., found in Durban, Ashanti and Lagos ; *Stegomyia fasciata*, F. ; *Ochlerotatus durbanensis*, Theo., rare at Durban, found also at Delagoa Bay, in Abyssinia and in Uganda ; *O. bevisi*, Edw. ; *O. albocephalus*, Theo., recorded also from Gambia and the Gold Coast ; *O. dentatus*, Theo. ; *O. quasiunivittatus*, Theo. ; *Taeniorhynchus metallicus*, Theo., widely distributed in Africa, the adults inhabiting marshes ; *T. aureus*, Edw. ; *T. chubbi*, Edw. ; *T. fuscopennatus*, Theo., found also in Uganda and British East Africa ; *Mansoniodes africanus*, Theo., a swamp form, widely distributed in tropical Africa ; *M. uniformis*, Theo., known to carry filariasis ; *Culiciomyia nebulosa*, Theo. ; *Culex thalassius*, Theo., occurring also in Gambia, South Nigeria, the Gold Coast and Portuguese East Africa ; *C. tipuliformis*, Theo., found in South and East Africa, Canary Islands, Crete and North India ; *C. pipiens*, L. ; *C. fatigans*, Wied. ; *C. pallidocephalus*, Theo. ; *C. univittatus*, Theo., occurring also in Southern Spain ; *C. simpsoni*, Theo., known also in the Transvaal and Rhodesia ; *C. tigripes*, Grp., the larvae of which prey on other mosquito larvae ; and *Eretmapodites quinquevittatus*, Theo., also recorded from Sierra Leone, Gold Coast, Belgian Congo and Madagascar.

FERRIS (G. F.). **Mallophaga and Anoplura from South Africa, with a list of Mammalian Hosts of African species.**—*Ann. Durban Mus., Durban*, i, no. 3, 20th April 1916, pp. 230–252, 12 figs. [Received 5th June 1916.]

The following Anoplura are recorded :—*Scipio aulacodi*, Neu., and *S. breviceps*, sp. n., from *Thryonomys* sp. ; *Haematopinus phachochoeri*, Enderl., from *Potamochaerus chocropotamus* ; *Linognathus angulatus*, Piag., from *Cephalophus natalensis*; *L. fahrenholzi*, Paine, from *Cervicapra fulvorufula*; *Hoplopleura intermedia*, Kell & Ferr., from *Mus coucha*.

A list of the Mammalian hosts of African species of Mallophaga and Anoplura is appended.

CHUBB (E. C.). **Note on the New Zululand Tsetse Fly,** *Glossina brandoni*, **Chubb, and a record of the Butterfly,** *Danais petiverana*, **Dbb. and Hew. in Natal.**—*Ann. Durban Mus., Durban*, i, no. 3, 20th April 1916, pp. 253–254. [Received 5th June 1916.]

A single female specimen of *Glossina brandoni*, Chubb, was obtained in 1915 in the Court-house of Ubombo, Zululand. This species, which is very closely related to *G. austeni*, Newst.,* differs from the common Zululand species, *G. pallidipes*, Aust.

CHATTON (E.) & BLANC (G.). **Un Pseudo-parasite,** *Cryptoplasma rhipicephali*, **Chatton et Blanc.** [A pseudo-parasite, *Cryptoplasma rhipicephali*, Chatton and Blanc.]—*C. R. Soc. Biol., Paris*, lxxix, no. 10, 20th May 1916, p. 402.

The forms occurring in the alimentary tract or body cavity of a supposed nymph of the tick *Rhipicephalus sanguineus*, and regarded as an endoparasite (*Cryptoplasma rhipicephali*), are now recognised to have been spermatozoa [see this *Review*, Ser. B, iv, p. 63]. The preparation was erroneously labelled "nymph," being in reality an adult male.

GASKELL (Major T. K.). **The Hibernation of Flies in a Fifeshire House.**—*Scottish Naturalist, Edinburgh*, no. 54, June 1916, p. 139.

During March 1916, large numbers of *Limnophora septemnotata* were found in a house at Largo, and were especially abundant in a room with a western aspect. Other specimens collected from a south room were *Pollenia rudis*, *Aphiochaeta rufipes*, *Pyrellia eriophthalma*, *Muscina stabulans*, *Phaonia signata*, *Leria serrata*, *Simulium* sp. and several Chalcids.

WATERSTON (J.). **On the Occurrence of** *Stenomalus muscarum* **(Linn.) in company with Hibernating Flies.**—*Scottish Naturalist, Edinburgh*, no. 54, June 1916, pp. 140–142.

Specimens of the Chalcid, *Stenomalus muscarum*, L., were obtained from the rooms of a house at Largo during March 1916. This species is more or less constantly found in houses together with hibernating Diptera. It is reported to have been bred from the puparia of *Musca* and eggs are believed to be deposited on Muscid larvae. All the hibernating specimens examined were females. The association of *S. muscarum* with the Diptera may be accidental or may be an adaptation on the part of the former to facilitate oviposition in the spring. In the family PTEROMALIDAE the following genera are also known to parasitise household insects:—*Spalangia*, Latr., on *Musca*; *Cerocephala*, Westw., on *Calandra*; *Arthrolytus*, Thoms. and *Dibrachys*, Först., on various hosts; and *Pteromalus*, Swed., on Lepidoptera.

---

* [There is little doubt that it is identical with *G. austeni*.—ED.]

Hewitt (C. G.). **Outline of Entomological Work projected for 1916.**—*Agric. Gaz. Canada, Ottawa*, iii, no. 5, May 1916, pp. 400–402.

The increase in the numbers of the warble fly [*Hypoderma*] in certain parts of Quebec devoted to dairy farms has led to an enquiry into the distribution and means of control of these insects. The study of ticks affecting live-stock will be continued. Further data will be obtained on the breeding habits and control of Canadian mosquitos. Experiments will be carried out on the control of bed-bugs by superheating.

Dollman (H. C.). *Glossina morsitans*, **Westw. Some Notes on the Parasitisation of its Pupae.** — *Trans. Entom. Soc. London*; *London*, nos. 3 and 4, 1915, 2nd June 1916, pp. 394–396, 1 plate.

Pupae of *Glossina morsitans* collected from beneath fallen or felled trees in the district of Namaula, North-west Rhodesia, in August and September 1915, showed a high degree of parasitism by *Mutilla glossinae*, Turn. Adults of *M. glossinae* emerged between 28th August and 9th September; the total number, viz., 63, included only one female.

Girault (A. A.). **A New** *Phanurus* **from the United States, with Notes on allied Species.**—*Canadian Entomologist, London, Ont.*, xlviii, no. 5, May 1916, pp. 149–150.

Phanurus emersoni, sp. n., reared from Tabanid eggs at Dallas, Texas, is described. Notes are given on the allied species, *P. opacus*, How., *P. floridanus*, Ashm., and *P. ovivorus*, Ashm.

Townsend (C. H. T.). **New Genera and Species of Australian Muscoidea.**—*Canadian Entomologist, London, Ont.*, xlviii, no. 5, May 1916, pp. 151–160.

A number of new genera and species of Australian flies are proposed and described, including *Paracalliphora* (genotype *Calliphora oceaniae*, R. D.) and *Tracheomyia*. The genotype of the latter, *Oestrus macropi*, Frogg., occurs in the larval stage in the windpipe of the kangaroo. This species appears to be an endemic Australian species, and the larval habitat is unique. It may be allied to *Pharyngomyia* or *Pharyngobolus*, but in its larval characters more closely approaches *Oestrus*.

Townsend (C. H. T.). **A new generic name for the screw-worm fly.**—*Jl. Washington Acad. Sci., Washington, D.C.*, v, no. 20, 4th December 1915, pp. 644–646. [Reprint received 14th June 1916.]

The generic name *Cochliomyia* is proposed for the screw-worm fly [*Chrysomyia macellaria*]. This genus is said to differ from *Chrysomyia*, R. D., in the character of the epistome.

TOWNSEND (C. H. T.). **Identification of the Stages in the Asexual Cycle of *Bartonella bacilliformis*, the Pathogenic Organism of Verruga, and their Bearing on the Etiology and Unity of Disease.**—*Jl. Washington Acad. Sci., Washington, D.C.*, no. 21, 19th December 1915, pp. 662–667. [Reprint received 14th June 1916.]

Phlebotomus verrucarum, Towns., has been proved conclusively to be a carrier of the Peruvian disease known as verruga. The specific organism of the disease, *Bartonella bacilliformis*, is a Protozoan, which passes through the asexual phases of multiplication in the endothelial cells of the capillaries of the subcutaneous tissues. Erythrocytes become infected during their passage through the capillaries when they come into contact with an infected endothelial cell. The eruption, which is characterised by the rapid proliferation of the endothelial cells, is the direct result of the asexual reproduction of *B. bacilliformis* in the subcutaneous tissues.

CHIDESTER (F. E.) & PATTERSON (R.). **The Influence of Various Concentrations of Sea Water on the Viability of the Salt Marsh Mosquitos, *Aedes sollicitans* and *Aedes cantator* (Dip.)**—*Entom. News, Philadelphia*, xxvii, no. 6, June 1916, pp. 272–274.

The degree of salinity of the pools of the salt marshes on the New Jersey coast is about seven or eight per cent., but may be subject to greater fluctuations. Two series of experiments were carried out to determine the effect of marked changes in salinity on the larvae of *Ochlerotatus* (*Aedes*) *sollicitans* and *O.* (*A.*) *cantator*. In the first series, larvae were transferred from pools to water varying from a 13 per cent. salinity to distilled water. Death soon occurred in the more concentrated solutions and in distilled water. In the second series, larvae were placed in solutions varying from 16 to 35 per cent. salinity; none were able to survive in the 22 per cent. or higher concentration for more than two days. Further examination of pools showed that in one case many larvae of *O. sollicitans* were living in water with a 22 per cent. salinity, at a temperature of 64° F., while none were present in a pool a short distance away, where the salinity was 24 per cent. and the temperature 67° F. Other records showed that *O. sollicitans* were able to withstand a higher degree of salinity than *O. cantator*. The distribution of various species of mosquitos over the salt marshes appears to be dependent to a certain extent on the amount of salt present in the water ; this factor may also influence the development of the eggs.

STURGESS (G. W.). **Report of the Government Veterinary Surgeon for 1915.**—*Ceylon Administration Report, 1915, Colombo*, Part 4, 9th April 1916, 8 pp. [Received 26th June 1916.]

During October cattle in the Matale District were troubled by biting flies, which were identified as *Haematopota singalensis*. Sarcoptic mange occurred among goats in the Mannar District and resulted in the death of the animals in some cases. Treatment consisted of dipping the animals in izal solution (1 oz. to 1 gal. water), followed by the application of a mixture of kerosene, sulphur, and coconut oil if necessary.

Morison (J.) & Keyworth (W. D.). **Flies and their Relation to Epidemic Diarrhoea and Dysentery in Poona.**—*Ind. Jl. Med. Research, Calcutta,* iii, no. 4, April 1916, pp. 619–627, 3 charts, 2 tables. [Received 30th June 1916.]

The observations in this paper form a continuation of those carried out during 1912 and 1913 [see this *Review*, Ser. B, iii, p. 127]. During 1914, counts of flies were made at stations in which the conditions were maintained without marked change from day to day. As in preceding years, a close correlation existed between the number of flies and cases of diarrhoea from 10th June to 12th August; after this date the flies began to decrease, but the epidemic did not reach its maximum until 19th August. Flies were therefore not responsible for cases of disease which occurred between 12th and 19th August, but a direct connection was believed to exist between these cases and the access to a polluted water supply occasioned by previous floods. In 1915 attention was directed to the water supply. Settling tanks, which had been installed in August 1914, resulted in an improvement in the health of the people as a whole during the dry season of 1914–15. Polluted flood water was not used. On and after 1st July in the city and 7th August in the cantonments, water was treated with hypochlorite of lime. The result was the absence of the usual epidemic during July and August, and no increase in the death-rate among children such as usually occurred at this period was recorded. This treatment of the water has been adopted as a permanent measure. The conclusion is reached that flies are responsible to a very slight degree, if at all, for the mortality in the native city of Poona or for the annual epidemic of disease in the cantonment.

Christophers (S. R.) & Chand (K.). **A Tree-Hole Breeding** *Anopheles* **from Southern India:** *A.* (*Coelodiazesis*) *culiciformis*, **Cogill.** —*Ind. Jl. Med. Research, Calcutta,* iii, no. 4, April 1916, pp. 638–645,1 plate. [Received 30th June 1916.]

A description is given of the larva and nymph of *Anopheles culiciformis*, Cogill, the former stage having been obtained in tree-holes at Pudupadi. The larvae are carnivorous in habit, feeding on each other and different insects. The water from which they were collected was dark brown in colour. This species was not found in any other districts visited. On the Nilgiri Plateau *A. gigas*, *A. lindesayi*, *A. aitkeni*, *A. jeyporiensis*, *A. maculipalpis* and *A. maculatus* were present. Below Sigur Ghat (3,000 ft.) the last four species, together with *A. sinensis*, *A. tessellatus*, *A. leucosphyrus*, *A. barbirostris* and *A. rossi*, were found. At Calicut the commonest species was *A. jamesi*. In the Malabar Wynaad forest *A. aitkeni*, *A. barbirostris*, *A. culiciformis*, *A. elegans* and *A. rossi* occurred. *A. rossi* var. *vagus* was present at Palghat.

Cornwall (J. W.) & La Frenais (H. M.). **A Contribution to the Study of Kala-Azar.**—*Ind. Jl. Med. Research, Calcutta,* iii, no. 4, April 1916, pp. 698–724, 3 plates, 5 tables. [Received 30th June 1916.]

Cultures of flagellates of *Leishmania donovani* were obtained from the peripheral blood of seven patients in whom kala-azar had either been diagnosed or suspected. It is possible that in future this method may prove of value in the diagnosis of the disease. In testing the effect of certain substances on the flagellates, it was found that fresh vertebrate serum was usually fatal within a few hours, but in some cases the flagellates survived for 24 hours or more. Heated serum was less fatal in its effects. Rabbit blood proved to be the most suitable medium for procuring cultures. In inoculation and feeding experiments no flagellates were seen to enter epithelial cells from a rabbit's stomach. One white rat became infected by an intraperitoneal injection of flagellates; bugs fed on this rat did not become infected. *Cimex hemiptera* (*rotundatus*) was fed on citrated blood containing *L. donovani* flagellates through a membrane of rabbit skin. Numerous flagellates were found in the stomach of the bug immediately after feeding and were also present 29 days later, together with round or oval bodies without flagella resembling the *L. donovani* body of kala-azar. Development of the flagellates in the stomach did not take place at temperatures of 61° F. or lower. A subsequent feed on a normal rabbit or rat or on sterile citrated rabbit's blood did not completely destroy the flagellate forms in the stomach. It is possible that a bug, if infected as a larva, may retain the infection throughout life. In a number of preparations of the stomach contents of infected bugs an apparently new thick-tailed flagellate form was observed. Experiments carried out to determine whether bugs can transmit kala-azar to man proved that flagellates present in the stomach were not transferred to sterile citrated human or rabbit's blood during the act of feeding. The view that bugs can directly transmit kala-azar to man thus receives little support.

Korke (V. T.). **On a *Nosema* (*Nosema pulicis*, n. sp.) Parasite in the Dog Flea (*Ctenocephalus felis*).**—*Ind. Jl. Med. Research, Calcutta,* iii, no. 4, April 1916, pp. 725–730, 1 plate. [Received 30th June 1916.]

Nosema pulicis, sp. n., infesting *Ctenocephalus felis* is described. Infection of flea larvae begins in the mid-gut and later extends throughout the entire alimentary canal. Infected larvae are characterised by their dark and mottled appearance. Under experimental conditions, adults did not readily develop from such larvae, but this may have been due to the advent of cold weather.

Villeneuve (J.). **Description de quelques Anthomyidae nouveaux d'Afrique.** [Description of some new Anthomyiidae from Africa.] *Ann. Soc. Entom. France, Paris,* lxxxv, no. 1, May 1916, pp. 145–150.

The following new species are described:—*Pyrellia versatilis*, from Ruwenzori; *P. bequaerti*, from Ruwenzori; *P. ditissima*, from Belgian Congo, Transvaal, Natal and British East Africa; *P. ano-rufa*, from Cape Colony; *P. maculisquama*, from East Africa; *P. distincta* and *P. laxifrons* from the Belgian Congo; *Limnophora semiargentata*, and *Fannia setigena*, from Ruwenzori. The presence of *P. cadaverina*, L., in the Belgian Congo is noted.

Villeneuve (J.). **Contribution à l'Etude des Calliphorinae africains du Genre** *Paratricyclea*, **Villen.** [Contribution to the study of African Calliphorinae of the genus *Paratricyclea*, Villen.]—*Ann. Soc. Entom., France, Paris,* lxxxv, no. 1, May 1916, pp. 151–158.

Additional notes are given on the genus *Paratricyclea* and the following new species described :—*P. nigroviolacea,* from Cape Town ; *P. consors,* from Nyasaland ; *P. imitans,* from Nyasaland, Nigeria and Belgian Congo ; *P. dubiosa,* from Nyasaland ; *P. gambiensis* from Gambia ; *P. lutescens,* from Belgian Congo ; *P. caerulea,* from Ruwenzori ; *P. pseudolucilia* from Belgian Congo. A key to the known species of the genus is appended.

Miessner (H.). **Zahlreiche Todesfälle beim Rind in der Leineniederung, veranlass durch** *Simulium reptans.* [Numerous deaths among cattle in the lowlands of the Leine, caused by *Simulium reptans.*]—*Deutsche Tierärztl. Wochenschr., Hannover,* xxiv, no. 20, 13th May 1916, pp. 183–185, 1 plate.

In 1915 a number of deaths were again caused by *Simulium reptans* among cattle in the lowlands of the Leine from 22nd to 25th April [see this *Review,* Ser. B, ii, p. 146]. Features of the present outbreak are the great number of deaths and the presence of infection in localities seven or more miles from the banks of the Leine. The latter is due to *Simulium* infestation of the streams flowing into the Leine, to weather conditions favourable to the fly and to a strong east wind immediately subsequent to the emergence of large numbers.

Schumann (P.). **Beitrag zur Sarkoptesräude des Pferdes.** [Notes on the sarcoptic mange of the horse.]—*Deutsche Tierärztl. Wochenschr., Hannover,* xxiv, no. 21, 20th May 1916, pp. 194–195.

In treating mange in army horses it is important to decide whether the animals must be shaven entirely or only in the affected spots, and also whether the mites regularly migrate to preferred places or settle direct on the infected spots. The author's experiments with two horses resulted in the following conclusions :—(1) The incubation period lasted 17 and 24 days ; it is shorter in the long winter hair and longer when the coat is shorn. (2) The mites find more favourable conditions in the long winter hair. They settle at the infected spot and spread from it. These do not appear to be preferred spots in the sense that the mites migrate to them from the infected spot and then burrow.

Knese (—.). **Die Sarcoptesräude der Pferde und ihre Behandlung.** [Sarcoptic mange of horses and its treatment.]—*Deutsche Tierärztl. Wochenschr., Hannover,* xxiv, no. 21, 20th May 1916, p. 195.

The following liniment is said to give good results in the treatment of sarcoptic mange : Turpentine, 1 : 4 ; linseed oil, 1 : 4 ; flowers of sulphur, 6 lb. per 10 gallons ; tartar depurat, 3 lb. per 10 gallons. Preparatory treatment consists in shearing the horse and in softening the scales with a mild cresol-soap liniment which is brushed in with a hard brush until the skin looks clean. On the next day the liniment given above is brushed on in a thick coat; its action lasts for several days. For the next eight days rubbing should be carried out with wood, wool or straw, a brush being liable to hurt the animal. On the eighth day the coating should be washed away with warm soapy water, but it is better to leave it on until it gradually comes away. Only in very bad cases is a second application necessary.

Sitanala (J. B.). **Verslag omtrent den medischen dienst dij de 3° wetenchappelijke expeditie naar Zuid-Nieuw-Guinea, 1912-1913, voor zooverre waargenomen door J. B. Sitanella, Inl. arts.** [Report on the medical service of the third scientific expedition to southern New Guinea, 1912–1913, as it in so far pertained to the charge of J. B. Sitanella, native medical practitioner.]—*Meded. Burgerlijk. Geneesk. Dienst. Ned.-Indië, Batavia,* 1915, pt. 4, 1916, pp. 1–14. [Received 30th June 1916.]

The region explored by the expedition comprised the Lorentz river and the country between this river and Mount Wilhelmina, one of the snow-covered peaks of the Orange mountains. The experience gained by former expeditions showed that active prophylaxis against malaria and beriberi would be necessary. Malarial prophylaxis included the administration of quinine, the use of mosquito-nets and fumigation by means of fires of green wood. Out of every ten mosquitos killed, at least nine were Anophelines. Early in November only a few small Anophelines occurred at Kloofbivak, which only attacked in the dark. During the first half of December, however, the numbers of mosquitos increased considerably and larger species of Anophelines were present which also attacked in the light.

Swellengrebel (N. H.). **Verslag over de muskieten verzameld door den inlandschen arts, Sitanella, gedurende de 3de wetenschappelijke expeditie naar Z. Nieuw Guinea, 1912-1913.** [Report on the mosquitos collected by the native medical practitioner Sitanella, during the third scientific expedition to southern New Guinea, 1912–1913.]—*Meded. Burgerlijk. Geneesk. Dienst Ned.-Indië, Batavia,* 1915, pt. 4, 1916, pp. 15–16. [Received 30th June 1916.]

The mosquitos sent for identification arrived in very bad condition and it was only possible to identify examples of *Anopheles* (*Myzorhynchus*) *barbirostris.*

De Raadt (O. L. E.). **Het vlooienverlies bij de levende rat.** [The loss of fleas from the living rat.]—*Meded. Burgerlijk. Geneesk. Dienst Ned. Indië, Batavia,* 1915, pt. 4, 1916, pp. 17–19. [Received 30th June 1916.]

The rat-flea only uses its host as a source of food and frequently leaves it between feeds. Under normal circumstances the flea will always be able to find a rat to return to, but where the number of rodents has been greatly decreased (for instance, if plague prevails among them) it is possible that the flea may be driven by hunger to attack man. The author has tried to ascertain whether fleas deprived of their food under such circumstances are sufficiently numerous to be likely to infect man with bubonic plague. Two experiments are described. It would appear that when rats are not constantly in the immediate neighbourhood of fleas owing to their scarcity, the total loss of fleas is considerably greater (38–43 per cent. of the total number) than when the host is constantly present. This fact must be considered when investigating the possibility of man being infected with bubonic plague by living rats which have only been temporarily in his vicinity.

De Raadt (O. L. E.). **Bijdrage tot de Kennis der epidemiologie van de pest op Java.** [Contribution to the knowledge of the epidemiology of plague in Java.]—*Meded. Burgerlijk. Geneesk. Dienst Ned.-Indië, Batavia*, 1915, pt. 4, 1916, pp. 20–38, 3 plates.

The first part of this paper deals with researches in connection with the significance of the rat-fleas found on Javanese rats for determining the source of these rats. It would appear that *Xenopsylla cheopis* is most prevalent on rats caught indoors, much less so on rats caught in the fields, and that it is entirely absent on rats taken from the coffee plantations, while *Pygiopsylla ahalae* is most prevalent on rats from the coffee plantations, much less so on those from houses and least of all on those from the fields. The conclusion drawn from this is that the necessary conditions for the development of *X. cheopis* are solely to be found indoors and this flea may therefore, to a certain extent, be called a house flea. Its appearance on rats taken in the fields and in coffee plantations can only be explained by its transportation from the houses by means of house- and also of field-rats. It is further held that the conditions for the development of *Pygiopsylla ahalae* are most favourable in the coffee plantations and probably also in the woods. It is doubtful whether such conditions obtain indoors, and the presence of this flea indoors is probably due to introduction by rats which live in the coffee plantations. It may be noted that *P. ahalae* is absent in houses in districts where there are no coffee plantations or woods. Differences of temperature cannot account for this inability of *P. ahalae* to develop indoors and differences in moisture—due to the great amount of shade in the plantations—may probably be the cause of it. This accords with the statement by Swellengrebel, that the *P. ahalae* index is much more dependent on the humidity of the atmosphere than the *Xenopsylla* index and that *Pygiopsylla* rapidly decreases in numbers after the rainy season. From the above results, the conclusion is arrived at that the species of flea may, to a certain extent, be used as an indicator for the origin of the rats. A high *Pygiopsylla* index, when combined with the absence of *X. cheopis* or with a low *X. cheopis* index, signifies that the rats come from coffee plantations or woods, while a high *X. cheopis* index denotes that the rats have come from the houses. Another conclusion is that a high *P. ahalae* index of rats caught indoors, taken in connection with the unfavourable conditions indoors for the development of *P. ahalae*, points to a great immigration of wood- and coffee-plantation-rats into the houses. Taking into consideration the great probability of a close intercourse between indoor rats living in the houses and those living in the coffee-plantations and further the considerable number of fleas infesting the latter, the possibility of rat plague being transmitted from one village to another by these indoor-rats, living out-of-doors, cannot be held to be exceptional.

The second section covers investigations concerning the biology of Javanese house and field-rats. There are two varieties of house-rat in Java, namely the larger, *Mus rattus griseiventer*, Bonh., and the smaller, *Mus rattus concolor*, Blyth. Though morphologically distinct, these two varieties do not differ in their habits ; being climbing species, they both live by preference in the upper parts of houses and are therefore of great importance as regards human plague. In view of the fact that Java is very thickly populated, the villages being at comparatively short distances from each other, about three-quarters of a mile on an average, it was of interest to ascertain whether house-rats were really incapable of moving from one village to another. In certain experiments it was found that from 5 to 9·6 per cent. of the rats caught in the rice-fields, at an average distance of about 650 yards from the nearest village boundary, were house-rats ; the rest were all field rats. From the *X. cheopis* index on the former, they must be held to have emigrated from the houses and to be living in the fields temporarily. In July 1913 an outbreak of rats was reported in some coffee plantations in the district of Malang, *Coffea robusta* being chiefly affected. According to Dr. Wurth, the fact that *Coffea liberica* (Liberian coffee) and *Coffea arabica* (Java coffee) have not such a strongly developed pith or so soft a bark, accounts for their comparative immunity. The author commenced an investigation as to the rats on the Kali Tello and Alas Tledek plantations and found that there were from 36·7 to 45 per cent. house- and from 63·3 to 55 per cent. field-rats. Investigations made in Java- and Robusta-coffee plantations (where there had been no outbreak) showed 84·5 to 92·2 per cent. of house-rats. They were therefore not responsible for the outbreak, and form the chief portion of the normal rat population of the coffee-plantations. The smaller examples, *M. concolor*, were mainly represented and it is supposed that these were driven out of the houses by the larger *M. griseiventer.* Their food-stores always consisted of the young shoots of *Saccharum spontaneum*, L. (wild sugar-cane) and the fruit of *Phyllanthus emblica*, L., which grows wild in the plantations. They do not therefore damage the coffee-trees.

In Java the field-rat is represented by *M. rattus diardii*, Jentink. It is normally present in the proportion of from 1·6 to 15·1 per cent. in coffee-plantations, but this rises to 55–63·3 per cent. in coffee-plantations where the crop has suffered considerable damage from a sudden influx of rats. It may therefore be assumed that the injury to coffee is caused by rats which migrate and that these are field-rats. No definite reason can be assigned for their attacking coffee which is untouched by the normal rat population, but it may be supposed that the latter find the food they prefer more easily than those migrants suddenly placed in strange surroundings.

De Raadt (O. L. E.). **Kunnen hoofdluizen pest overbrengen?** [Can plague be spread by head-lice?]—*Meded. Burgerlijk. Geneesk. Dienst Ned.-Indië, Batavia*, 1915, pt. 4, 1916, pp. 39–40. [Received 30th June 1916.]

Swellengrebel has proved that *Pediculus humanus* (*vestimenti*) is a factor in the spread of bubonic plague. That this also applies to *Pediculus capitis* the author considers to be proved by five inoculation experiments which are briefly outlined. The head-lice from a plague patient were ground in a mortar with salt solution and the mixture was then injected into rodents, all the experiments being positive.

De Vogel (W. Th.). **Rapport over het onderzoek aangaande den gezondheidstoestand van de havenplaats Sibolga, Residentie Tapanoeli, verricht van den 24sten April tot den 6den Mei 1913.** [Report on investigations into the sanitary conditions of the port of Sibolga, Tapanoeli Residency, from 24th April to 6th May 1913.]—*Meded. Burgerlijk. Geneesk. Dienst Ned.-Indië, Batavia*, 1915, pt. 4, pp. 62–98, 2 maps, 3 charts, 10 figs. [Received 30th June 1916.]

This paper details the investigations undertaken as a preliminary to planning the sanitation of the malaria-infected port of Sibolga on the west coast of Sumatra. Mosquitos were breeding in a number of places. A number of Anophelines, thought to be all *A.* (*M.*) *ludlowi*, predominated in small, isolated pools and in marsh grass. In another group of breeding places, mainly consisting of "sawah" rice land, *Culex* was predominant, other species present being *A.* (*M.*) *ludlowi* and *A.* (*M.*) *rossi.* The anti-malarial measures advised are the clearing of the breeding places marked on the maps accompanying this report, quinine prophylaxis and the building of a system of covered channels for dealing both with surface water and sewerage.

Shircore (J. O.). **A Method for the Trapping of *Glossina morsitans* Suggested for Trial.**—*Trans. Soc. Trop. Med. & Hyg., London*, ix, no. 3, January 1916, pp. 101–102, 3 diagrams. [Received August 1916.]

Diagrams are given of a suggested method of trapping *Glossina morsitans*, based on the known habits of this tsetse. The traps consist of revolving canvas screens smeared with adhesives which are placed on routes known to be frequented by the flies.

Macfarlane (R. M.). **The Sanitation of a Small European Settlement in Portuguese East Africa; with Notes on some of the Diseases Prevalent in the District.**—*Trans. Soc. Trop. Med. & Hyg., London*, ix, no. 5, March 1916, pp. 139–156, 1 map, 1 fig. [Received August 1916.]

This paper gives an account of the measures taken for the sanitation of a new mission station in Portuguese East Africa, about 160 miles east of the Nyasaland border. The commonest form of mala ia seemed to be simple tertian, due to *Plasmodium vivax.* Mosquitos were never numerous, though the majority were Anophelines. The greatest incidence of malaria coincided with the end of the rains, and the following month. Regular attention was paid to the breeding places of mosquitos from the time that the first case of fever occurred. The stagnation of water in channels was prevented as far as possible ; oiling was not found practicable owing to the high cost of petroleum. Quinine prophylaxis and the use of mosquito nets were adopted.

Sleeping sickness is not known to exist in the district and tsetse-fly was said to be very scarce.

African tick fever, of which a case was noticed, is probably not endemic in the district, as the author did not meet with *Ornithodorus moubata* in any of the villages.

MacGregor (M. E.). **Note on *Culex pipiens* breeding 66 ft. below ground.** — *Jl. Trop. Med. & Hygiene, London,* xix, no. 12, 15th June 1916, p. 142.

In June 1915 workmen employed by the London Underground Electric Railway Company were seriously attacked by a biting insect when working by night in a " dead end " of the Highgate Station, 66 ft. underground. Investigation showed that numbers of *Culex pipiens* were present, which had bred in a water tank below the passenger platform. The water, which teemed with larvae and pupae, was treated with sanitas-okol and this destroyed them satisfactorily.

Given (Staff-Surgeon D.H.C.). **The Campaign against Mosquitoes on board H.M.S. " Cadmus."**—*Jl. State Medicine, London,* xxiv, no. 2, February 1916, pp. 47–51, 2 figs.

Hankow is considered to be one of the worst ports on the Yangtse for mosquitos. There is, however, comparatively little malaria among the foreign communities, the chief trouble caused by mosquitos which are mostly Culicines, being the irritation due to their bites at night. On board H.M.S. Cadmus anti-mosquito measures were undertaken early in April. After cleansing out the bilges of the ship's sampans, which were mainly responsible for the mosquitos on board, and replacing their thatched covers by light canvas awnings, removable at sunset, the diminution in numbers was very marked. Mosquitos still continued, however, to reach the ship, which was anchored 300 yards from the bank, being perhaps blown off passing vessels. All the scuttles and ports of the ship were fitted with fine wire gauze netting, though this proved of little value. The use of mosquito nets, oil of citronella and a Japanese remedy consisting of fumigation with joss-sticks were more effective. It was found difficult to fix netting round a hammock so as to render it mosquito-proof, but two fairly satisfactory torpedo-shaped nets were devised, illustrations of which are given. In consequence of the precautions taken, there was not a single case of malaria on board during a ten-months' stay up the Yangtse, though a number of cases occurred on other ships.

ENTOMOLOGICAL NOTICES.

During May and June of this year, Professor H. Maxwell Lefroy (Temporary Lt.-Col., R.A.M.C.) was on special duty in Mesopotamia connected with fly investigations.

We regret to record that 2nd-Lt. R. A. F. Eminson, King's Royal Rifle Corps, has been killed in action. Mr. Eminson had recently carried out some valuable investigations into the bionomics of *Glossina morsitans* in Northern Rhodesia.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 27, Elvaston Place, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.

The Bionomics of *Glossina morsitans* in Northern Rhodesia .. 117
Mosquitos of the Chilka Lake, India 118
The Bionomics of *Ornithodorus coriaceus* in California 119
Anoplura from Zululand 120
A List of Mosquitos occurring at Durban 120
Anoplura from South Africa 120
Note on the new Zululand Tsetse-Fly, *Glossina brandoni* 121
A Correction regarding *Cryptoplasma rhipicephali*, a supposed Tick Parasite 121
The Hibernation of Flies in Houses in Scotland 121
Stenomalus muscarum in company with Hibernating Flies in Scotland 121
Outline of Entomological Work projected for 1916 in Canada .. 122
Notes on *Mutilla glossinae* in Rhodesia 122
A New Parasite of Tabanid Eggs in the U.S.A. 122
New Genera and Species of Australian Flies 122
Proposed New Generic Name for the Screw-worm Fly 122
The asexual Cycle of *Bartonella bacilliformis*, the pathogenic Organism of Verruga in Peru 123
The Influence of Sea Water on the Salt Marsh Mosquitos in the U.S.A. 123
Insects infesting Domestic Animals in Ceylon 123
Flies and their Relation to Epidemic Diarrhoea and Dysentery in Poona 124
Anopheline Mosquitos in Southern India 124
Experiments with Bed-bugs and Kala-azar in India 124
Nosema pulicis, sp. n., infesting *Ctenocephalus felis* in India .. 125
New Anthomyid Flies from Africa 125
New Calliphorine Flies from Africa 126
Simulium reptans causing Deaths of Cattle in Hanover 126
Sarcoptic Mange of Horses and its Treatment in Germany 126
Mosquitos and Malaria in Dutch New Guinea 127
Mosquitos collected in Dutch New Guinea 127
The Relation between Fleas and Rats in Java 127
The Relation between Rats and Plague in Java 128
Pediculus capitis experimentally carrying Plague in Java 130
Mosquitos and Malaria in Sumatra 130
Suggestions for Trapping *Glossina morsitans* 130
Insect-borne Diseases in Portuguese E. Africa 130
Culex pipiens breeding 66 ft. below Ground in England 131
Measures against Mosquitos on Ships in China 131

VOL. IV. Ser. B. Part 9.—pp. 133-148. SEPTEMBER, 1916.

Smithsonian Institution
NOV 1 1 1916
National Museum

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., ***Chairman.***

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.

Dr. Guy A. K. Marshall.

Assistant Director.

Mr. S. A. Neave.

Assistant Editor.

Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—89, Queen's Gate, London, S.W.

PEACOCK (A. D.). **The Louse problem at the Western Front.**—*Br. Med. Jl., London,* nos. 2891 & 2892, May 27th & June 3rd, 1916, pp. 745–749 & pp. 784–788, 9 figs.

In the first part of this paper the anatomy and habits of *Pediculus humanus,* L., are dealt with at length. The eggs hatch in from 10 to 12 days, and though the longest period during which lice survive separation from the human body is nearly nine days, the maximum time during which eggs under such conditions may remain dormant is about 40 days. It is therefore an important fact that eggs on clothing, especially outer garments, if not treated regularly by ironing or disinfection, are a possible source of infestation for as long as a month after laying.

Details are given of the distribution of lice on the clothing, as well as of the degrees of infestation in the different classes of troops. The base trenches are somewhat less infested than the dug-outs, though the troops in them suffer about equally, owing to the impossibility of changing under-clothing in the former. Evidence is adduced that it is not the dug-outs themselves which harbour the pest, but the men and clothing in them. Blankets are said to be minor factors in dissemination and, though straw may be sufficiently infested at the end of seven days to infest men using it, as lice greatly prefer clothing to straw, the chances of straw becoming an important factor in conveying them is thought to be small. The men themselves, despite such efforts at cleanliness as can be made under the conditions, are the real carriers and centres of infestation.

A great number of experiments were made with insecticides and deterrents and N.C.I. (Naphthaline 96 %, creosote 2%, iodoform 2 %) proved the most efficient; the powder should not be used too freely, as it is apt to cause severe smarting. Vermijelli is also effective, but an ointment consisting of soft paraffin 2 lb. and crude tar oil 4 oz., proved still more so. A combined use of N.C.I. and Vermijelli gave a better result than either separately. Mercurial blue ointment did not give very good results, and its use over large areas of the body is impossible, as poisoning may result. Sulphur proved a complete failure. The methods of disinfecting clothing by steam and boiling water are briefly discussed as quite effective for large quantities; cresol solution, 1¼ % cold, will kill all lice on a shirt soaked in it for 1 hour; chloride of lime solution, 7 % cold, is effective in 24 hours, but alum, 10 % cold, was a total failure. Unless the clothing be thoroughly disinfected at the same time, mere bathing is only of temporary use.

The paper concludes with a number of practical suggestions for the individual and the organisation of disinfection on a large scale and the use of insecticides in the trenches, billets and hospitals.

KINLOCH (J. P.). **An investigation of the best methods of destroying lice and other body vermin. II.**—*Br. Med. Jl., London,* no. 2892, 3rd June 1916, pp. 789–793.

This paper is a continuation of a former one [see this *Review,* Ser. B, iii, p. 156]. As the result of a lengthy series of experiments, the author arrives at the following conclusions:—

Lice do not survive immersion in boiling water. Of several insecticidal powders which have been tested, N.C.I. is the most destructive; of the three constituents of this powder, naphthaline and creosote have each a strong insecticidal action, that of iodoform being feeble. Naphthaline appears to be the most suitable basis for use in the preparation of a powder destructive to lice. Commercial naphthaline is more actively insecticidal than pure naphthaline, and its lethal power is dependent in great part on the presence of hydrocarbons and coal-tar derivatives other than pure naphthaline. The immediate lethal effect of creosote when mixed with naphthaline is less than that of some other insecticidal liquids, but the longer period during which creosote continues to act more than compensates for the initial disadvantage. In addition to its feeble insecticidal activity, iodoform greatly increases the adhesiveness of N.C.I. powder for cloth. The inclusion of iodoform in the powder is accordingly justified, although similar adhesiveness of the powder is obtainable at less cost by substituting the insecticidally inert but cheaper magnesium silicate. The insecticidal power of naphthaline-creosote powders gradually diminishes when they are exposed to the open air. The moist nature of such powders precludes their being used successfully in perforated tins, and it has not been found possible to dry the powders and at the same time retain the moist and volatile hydrocarbons and other coal-tar derivatives on which their insecticidal effect mainly depends.

SERGENT (Edm.) & FOLEY (H.). **Epidémiologie de la fièvre récurrente** [The epidemiology of recurrent fever.]—*Malaria e Malattie dei. Paesi Caldi, Rome*, vii, no. 1, Jan.-Feb. 1916, pp. 1-7.

The discovery that *Pediculus humanus* (*vestimenti*) is a carrier of recurrent fever is described in this paper on the epidemiology of the disease. The infection is hereditary in the louse.

MONIZ (G.). **Destruição dos mosquitos adultos pelos vapores de creolina.** [The destruction of adult mosquitos by vaporised creolin.]—*Brazil Medico, Rio de Janeiro*, xxx, nos. 6 & 7, 5th & 12th February 1916, pp. 41-43 & 51-53.

The author considers that cresyl or creolin is more effective in destroying mosquitos than pyrethrum fumigation [see this *Review*, Ser. B, iv, p. 61]. The quantity to be used in closed rooms, for which this method is recommended, is 6 cc. for each cubic metre (40 cubic feet) of space. This should be placed in a container standing on a tripod in a basin of water on the floor. The quantity of alcohol required to vaporise 600 cc. of creolin has been found to be 270 cc. Waste of spirit is thus avoided and the room need not be entered to extinguish the lamp. As the vapour is a heavy one, it is unnecessary to paste up all cracks in the walls and floor; the doors and windows only require to be kept closed for three hours, after which all mosquitos and other insects will be dead.

NOCHT (B.) & MAYER (M.). **Merkblatt zur Vorbeugung und Behandlung der Malaria sowie zur Bekämpfung ihrer Ueberträger, der Stechmücken.** [A note on the prevention and treatment of malaria and on the control of its carriers, the mosquitos.]—*Münchener Mediz. Wochenschr., Münich*, lxiii, no. 17, 25th April 1916, pp. 623-625.

This is a concise review of present-day knowledge of the prevention and treatment of malaria by means of quinine and of the various measures adopted against mosquitos. Mosquito control is divided into winter and summer work, the former chiefly directed against the adult forms, while the latter aims at the destruction of the larvae. A short section deals with personal protection against the bites of mosquitos.

CORLETTE (C. E.). **The destruction of lice, bugs, and other insect pests, by hydrocyanic acid fumigation.**—*Med. Jl. Australia, Sydney*, i. (3rd year), no. 19, 6th May 1916, p. 391.

The author advises the use of hydrocyanic acid gas against lice, bugs and other insects. This method is adopted on the Australian coasting steamers and in the sleeping carriages on the Australian railways. Besides potassium cyanide, potassium ferrocyanide may be used. In this process 1 pint of water, 12 oz. of strong sulphuric acid and 1 lb. of coarsely powdered potassium ferrocyanide are required for each thousand cubic feet of space.

Australia and Yellow Fever.—*Commonwealth of Australia Quarantine Service Publication* no. 6, *Melbourne*, 95 pp., 4 maps, 13 figs.

The opening of the Panama Canal has directed attention to the question of the possibility of the introduction of yellow fever into Australia and this publication contains information on this subject. Sections 3 and 4, which deal with entomology, are mainly concerned with the distribution of *Stegomyia fasciata* in Australia and New Guinea, by F. H. Taylor. Section 3 contains the results of the survey of the chief coastal towns of Queensland in 1914 [see this *Review*, Ser. B, iii, p. 30] while section 4 is necessarily incomplete, as no organised mosquito survey of Australia and New Guinea has yet been attempted, and only a few disconnected observations are recorded.

BEYER (H. G.). **On the etiology of typhus fever and louse extermination, from the view point of the sanitarian.**—*Military Surgeon, Washington, D.C.*, xxxviii, no. 5. May 1916, pp. 483-491, 4 plates.

This paper is a condensed summary of present knowledge relative to the function of lice in epidemics of typhus-fever and the methods employed for their destruction during the present war. In experiments made by Pregl of Graz, when clothes sprinkled with a 25 per cent. solution of ammonia were locked up in a covered box, both lice and eggs were killed in one hour. Wet clothes cannot be as efficiently treated as dry ones. At the prison-camp at Puchheim, Lenz used naphthaline powder for killing eggs and lice remaining after clothes and their wearers had been disinfected. Every person, at bed-time, had a handful of finely powdered naphthaline put into his clothes, introduced through the opening at the neck. By sleeping with the clothes on, the body heat caused the naphthaline to evaporate, the vapours killing not only the remaining lice, but also most of the eggs. If this is done three times, a thorough and complete disinfection is said to be assured.

Barret (H. P.). **The mosquitoes of Mecklenburg county, North Carolina.**—*Amer. Jl. Trop. Dis. & Prevent Med., New Orleans*, iii, no. 11, May 1916, pp. 607–609.

This paper gives a list of the mosquitos in Mecklenburg county, North Carolina, especially from near Charlotte. It comprises: *Culex territans, C. restuans, C. fatigans* (*quinquefasciatus*), *C. pilosus*?, *Psorophora columbiae, P. discolor, P. sayi, Stegomyia fasciata* (*Aëdes calopus*), *Ochlerotatus* (*A.*) *sylvestris, O.* (*A.*) *canadensis, O.* (*A.*) *triseriatus, Megarhinus septentrionalis, Orthopodomyia* (*Bancroftia*) *signifer* and *Anopheles punctipennis. C. restuans* and *C. fatigans* were the commonest species found, the former throughout the season and the latter from the middle of summer on. They usually breed in rain barrels, stagnant water and almost any temporary collection of rain water. *C. territans* was never taken near houses nor in stagnant water, but was commonest in slow-running streams. It does not attack man. *O. sylvestris* was frequently found at the end of summer and always in temporary rain pools. *S. fasciata* was often found in cans, rain-barrels, etc., and always near dwellings. *O. canadensis* was found only once during the summer. It was one of a number of species breeding in a water-filled pit in the woods. *A. triseriatus* was taken on one occasion from a tree-hole and from a can, both in the same locality. *P. discolor* was found once, in a temporary rain-pool. The larvae of *P. sayi* were not found, but the adults were often caught in the woods. Larvae of *O. signifer* were found in large numbers in a tree-hole. *A. punctipennis* was found in almost every kind of breeding place, except tree-holes.

Mitzmain (M. B.). **Tertian malarial fever. Transmission experiments with** *Anopheles punctipennis.*—*Public Health Repts., Washington, D.C.*, xxxi, no. 19, 12th May 1916, pp. 1172–1177.

This paper describes work confirming King's discovery of the infection of *Anopheles punctipennis*, Say, by *Plasmodium vivax* [see this *Review*, Ser. B, iv, p. 53]. Under the conditions cited, 32·5 per cent. of the forty mosquitos experimented with were positive, as against 10·5 per cent. of nineteen *A. crucians*, Wied., fed at the same time and kept under identical conditions. Two examples of *A. quadrimaculatus*, Say, used as additional controls, proved to be negative. Only twenty specimens of *A. punctipennis* survived six days or longer after biting. With a feed on blood of low infectivity, thirteen individuals of *A. punctipennis* showed infection in from six to twenty-five days. Eight of the positive specimens became infective, as shown by moderate to immense numbers of typical sporozoits invading the salivary glands. In the control series of nineteen *A. crucians*, two, or 10·5 per cent., were infective with the parasites of *P. vivax* eleven and thirteen days after biting. The infectibility of *A. punctipennis* was demonstrated in the transmission of the disease through the biting of four mosquitos, which reproduced the infection in three healthy volunteers living in New Orleans during February 1916, after incubation periods of fourteen and fifteen days. One of these persons had escaped infection four months previously from the bites of more than 200 *A. punctipennis* in two experiments with the subtertian type. From this single instance it is indicated that *A. punctipennis* served as a host for *P. vivax*, but not of *P. falciparum.*

Derivaux (R. C.). **A Note on the Predaceous Habits of *Dineutes* ("Whirligig Beetles") toward *Anopheles* Larvae.**—*Public Health Repts., Washington, D.C.*, xxxi, no. 20, 19th May 1916, pp. 1228–1230.

In the course of a sanitary survey conducted in Maryland during the summer of 1915, observations were made on a Gyrinid beetle, a species of *Dineutes*, an aquatic insect enemy of Anopheline larvae. In many instances even where the beetles were numerous, Anopheline larvae were not particularly difficult to find and a number of areas occurred where their presence had no appreciable influence.

It was, however, found that in an artificial container, such as a basin filled with clean water, Anopheline larvae were quickly captured and eaten, but the addition of surface débris, twigs, etc., gave very different results, only a few of the larvae being captured, and these, apparently, accidentally. The beetles seem to have great difficulty in discovering the larvae when concealed. It is therefore probable that, under natural conditions, these beetles are of little practical importance.

Rat-proofing Ordinance held valid.—*Public Health Repts., Washington, D.C.*, xxxi, no. 22, 2nd June 1916, p. 1359.

The Supreme Court of Louisiana has upheld the Rat-proofing Ordinance adopted by the Commission Council of the city of New Orleans in June 1915. This ordinance requires the rat-proofing of all structures in the city, and makes it unlawful to construct or maintain any structure which is not rat-proofed as provided by the ordinance.

Kellog (V. L.). **The Transportation of Insects, with Special Reference to Disease Carriers.**—*Jl. Socialogic Med., Pittsburg, Pa.*, xvii, no. 3, June 1916, pp. 149–162.

Almost any insect that associates at all closely with man is a potential disseminator of germ-caused human disease and the majority of such insects are cosmopolitan, owing to transportation by man. As the distribution of disease-carrying insects is therefore chiefly due to human action, it should be possible to control it successfully.

Lutz (A.), Neiva (A.) & Costa Lima (A.). **Sobre "Pupipara" ou "Hippoboscidae" de aves brasileiras.** [Pupipara or Hippoboscids of Brazilian birds.]—*Mem. Inst. Oswaldo Cruz., Rio de Janeiro*, vii, no. 2, 1915, pp. 173–199, 2 plates. [Received 3rd July 1916.]

This systematic paper is based on a collection of 200 examples of Hippoboscids from Brazilian birds. They include:—*Pseudolfersia meleagridis*, sp. n., on *Meleagris gallopavo* (in Peru) and *Tinamus solitarius*; *Lynchia lividicolor*, Big., on domestic pigeons; *Microlynchia pusilla*, Speis., and *Stilbometopa* (?) *podopostyla*, Speis., on wild pigeons; *Pseudornithomyia ambigua*, gen. et sp. n., on *Peristera rufiaxilla*; *Olfersia palustris*, sp. n., on *Ardea* sp., *Tigrisoma* sp. and *Harpiprion cayennensis*; *Pseudolfersia spinifera*, Leach, on *Fregata* *aquila*; *P. vulturis*, Wulp, on vultures (in Mexico); *Olfersia raptatorum*, sp. n., on sparrow-hawks and *Cathartes aura* (golden-headed vulture); *Olfersia nigra*, Perty, and *Pseudornithomyia ambigua*, gen. et sp. n., on swallows. No definite hosts are given for :—*Ornithoctona erythrocephala*, Leach, *Olfersia holoptera*, sp. n., *Olfersia fusca*, Macq., and *Ornithoica confluens*, Say.

RODHAIN (J.) & BEQUAERT (J.). **Matériaux pour une Etude monographique des Diptères Parasites de l'Afrique. i.** [Materials for a Monograph on the Parasitic Diptera of Africa.]—*Bull. Sci. France et Belgique, Paris*, Ser. vii, xlix, no. 3, 29th April 1916, pp. 236–289, 14 figs. [Received 4th July 1916.]

The paper gives a historical account of the observations of Dufour, du Buysson, Roubaud, etc., on Dipterous larvae parasitic on birds, special attention being paid to the genus *Phormia*, R. D., *P. sordida* having been obtained from the nest of *Parus ater*, L. [see this *Review*, Ser. B, iii, p. 97]. *Passeromyia heterochaeta*, Villen., was first obtained from the nests of *Passer* sp. in the Congo in 1914 [see this *Review*, Ser. B, ii, p. 69]. It appears to be widely distributed in Central Africa, having been recorded from Nyasaland, Rhodesia, Katanga, and British East Africa; it has also been met with in China. In the Congo region larvae are abundant in nests in the Welle district, in the damp equatorial forest. The nests of swallows, various species of PLOCEIDAE, *Spermestes cucullata*, etc., as well as those of *Passer griseus*, form suitable breeding places. The youngest larva of which a description is given is that in the third stage. In nature, the larvae are apparently parasitic only on young birds, but under experimental conditions they have been induced to feed on adults. Neither eggs nor adult flies have been obtained under natural conditions. Experimentally, adults have been fed on fruit juice and the excrement of birds and mammals. Though pairing was observed, no eggs were deposited, and it is uncertain whether this species is oviparous or viviparous. It is probable that the young larvae adhere to the host until after the first moult, and are unable at any stage to withstand separation from the host for any considerable length of time. The change from the full-grown larva to the pupa takes place in a cocoon; adults emerge in from 12 to 14 days.

The larvae of two species of Calliphorine Muscids, *Cordylobia anthropophaga*, Blanch., and *C.* (*Stasisia*) *rodhaini*, Ged., cause cutaneous myiasis in Africa. The former species occurs from Senegal to the Cape, the latter only in the equatorial forest regions of the Congo. The usual host of *C. anthropophaga* is the domestic dog; *C. rodhaini*, on the other hand, occurs normally on wild hosts [see this *Review*, Ser. B, iii, p. 225]. Attempts made by the authors to produce artificial infection in a guinea-pig by placing the eggs of *C. rodhaini* on or near the animal met with positive results in very few cases. The immobility of the host is apparently essential for the larvae to be able to effect their entrance. Under laboratory conditions eggs were deposited on dry excrement or on substances impregnated with liquid manure. In nature it is probable that eggs are laid on substances impregnated with urine or with the sweat of the host. Previous investigations made in 1908 seemed to show that cases of myiasis were more common during the rainy than the dry season. It is possible that moisture is favourable to the transformation of the pupae and to oviposition, but further observations are needed on this point. The life-history of *C. rodhaini* is described. Two adults kept in captivity showed the presence of the Protozoan *Leptomonas* in the rectum. The position taken up by the larva in the skin of the host is perpendicular to the surface. In man, a tumor does not form until three or four days after infection, the larva reaching maturity in from 12 to 15 days. *Cricetomys*, attacked by seven larvae, showed a considerable loss in weight, but recovered as soon as the mature parasites emerged. According to Roubaud, the partial immunity to attacks of ver du cayor (*C. anthropophaga*) which some animals enjoy is due to the body temperature; in the case of *C. rodhaini* it seems probable that the thickness of the skin and the specific reactions of the tissues are important in determining whether a species is immune or not.

de BERGEVIN (E.) & SERGENT (E.). **A propos de l'hypothèse de la transmission du goître endémique par un insecte piqueur.** [Concerning the hypothesis of the transmission of endemic goitre by a biting insect.]—*Bull. Soc. Path. Exot., Paris,* ix, no. 6, 14th June 1916, p. 345.

The Reduviid, *Acanthaspis sulcipes*, F., occurs in certain regions in central Africa in which goitre is endemic, but is absent from the districts of Algeria in which goitre occurs. Representatives of an allied genus, *Holotrichius*, are found in these districts, but are not known to attack man. *Ectomocoris ululans*, Rossi, *Reduvius mayeti*, Put., *Pirates hybridus* and *P. strepitans*, which are slightly further removed from *Acanthaspis*, are also present, and the first two are blood-sucking forms. *E. ululans* is however rare and is found only in the desert regions where goitre is not known. In Algeria, therefore, there is probably no connection between blood-sucking Rhynchota and endemic goitre.

RANKIN (Major A. C.). **Simple Tertian Malaria in French Flanders.**—*Lancet, London,* no. 4839, 27th May 1916, pp. 1079–1080.

Among the troops in France a considerable number of individuals arrived with malarial parasites in their blood. In one examination of men who had served in a malarious country, 93 showed the presence of *Plasmodium vivax* and four of *P. malariae*. A specimen of *Anopheles bifurcatus* was taken in May and one of *A. maculipennis* early in June. Shortly afterwards the latter species was found to be widely distributed throughout the area. It was common in billets, barns, and outhouses, and persisted until September. The sylvan species, *A. bifurcatus*, was only met with occasionally. The possible spread of malaria among the troops in Flanders was not seriously expected, as it was thought that climatic conditions would be against it, and only a few cases did in fact occur. They prove, however, that *A. maculipennis* in Flanders is capable of conveying a strain, or strains, of *P. vivax*, tropical or sub-tropical in origin, under the conditions that obtained.

Holt (J. J. H.). **The Cockroach: Its Destruction and Dispersal. A Comparison of Insecticides and Methods.**—*Lancet, London*, no. 4840, 3rd June 1916, pp. 1136–1137.

This paper records the action of various substances on *Blatta* (*Periplaneta*) *orientalis* (common cockroach), tested in the course of some two or three years. Preliminary investigations in reference to general conditions gave some unexpected results. *B. orientalis* is able to live a long time without food or water, and one individual survived for 76 days in a petri dish. This insect can also live with a very limited air-supply and can survive submersion in water for 20 minutes. It eats practically all kinds of organic matter, including its own dead, but is soon adversely affected by contact with its own excreta. Extensive experiments were made with 25 volatile bodies, 31 aromatic oils, 8 coal-tar derivatives, all of which act through the respiratory system, 40 dusting powders, most of which act through the respiratory system, and 10 food-poisons. With regard to the latter, the tolerance of the cockroach for arsenic is remarkable, a lethal result requiring 41–96 hours. The results of these tests seem to indicate that many of the substances which have been supposed to kill cockroaches have really had the effect of only driving them away. For rapid destruction fumigation with bromine or sulphur dioxide is apparently the best method. For domestic purposes, the daily use of creosote, wood naphtha, or oil of rosemary, eucalyptus or citronella placed near the haunts of cockroaches for two or three weeks should effectually disperse them. Where these are inadmissible on account of their smell, odourless dusting powders may be used. Of these sodium fluoride was found to be the most effective. It is also cheap and keeps indefinitely. It is suggested that these experiments may have some value as applied to other insect pests.

Howarth (E.). **The Destruction of Cockroaches.**—*Lancet, London*, no. 4841, 10th June 1916, p. 1192.

With reference to the above article, it is pointed out that there is a wide difference between the application of inhalants and food-poisons. No reliable time effect is given by the fact that the lethal effects of all the volatile bodies mentioned are more rapid than the food-poisons, as the former were placed in covered dishes or bottles with imprisoned insects. The only comparable time test would be to use the remedy on cockroaches in their natural habitat. Having to destroy a plague of cockroaches at a large institution in Sheffield, the author found fumigation to be out of the question and decided to poison them in their retreats, so as to avoid their becoming mixed in the food. Their hiding places were easily discovered and the food-poison (Blattis) was laid down there and within three days the pests were dead. The value of this poison lies in its attractiveness, which is demonstrated by the rapidity with which the cockroaches devour it. Quite different material, a powdery food mixed with a non-volatile poison, had to be used for *Lepisma saccharina* (silver fish), which in one case was entirely killed off in 48 hours. To fumigate dwellings and institutions is practically impossible, and an exterminator that produces death in a few hours, with a cumulative effect due to the action of the poison in the bodies of cannibalistic cockroaches, is far more effective.

Burton-Brown (G.). **The Destruction of Cockroaches.** — *Lancet, London*, no. 4841, 10th June 1916, p. 1192.

This note records the efficiency of Dalmatian insect powder against cockroaches, contrary to Dr. Holt's experience. The powder was laid down along the floor near the walls.

Copeman (Lieut.-Col. S.M.). **Prevention of Fly-breeding in Horse-Manure.**—*Lancet, London*, no. 4841, 10th June 1916, pp. 1182-1184, 2 figs.

In various military camps during 1915 the plague of flies, owing to the proximity of horse-lines and the resultant heaps of manure, was very serious, and farmers who contracted for removal were unable to carry out the work with sufficient rapidity owing to shortage of labour, horses and carts. Incineration was tried, but countermanded as very wasteful. A borax dressing, as advocated in the U.S.A. [see this *Review*, Ser. B, ii, p. 179], though satisfactory in small experimental heaps, must be used in such quantity as might render the manure injurious to vegetation. Hellebore, also recommended in the U.S.A., is too costly [see this *Review*, Ser. B, iii, p. 193]. As an alternative, close packing was tried combined with the use of tetra-chlor-ethane, a gallon of which was poured into a depression on the upper surface of the heap of 500 cubic feet. The effect was tested by enclosing 12 maggots in each of a number of small wire-gauze boxes and burying these in different parts of the heap at a depth of about 4 inches; all the maggots were killed. Similar tests in heaps without any tetra-chlor-ethane gave essentially the same result. It was thus more or less proved that simple close packing of the manure was all that was necessary to prevent the breeding of flies. It was found that the piles should not exceed 5 feet in height, and that each fresh load should be firmly pressed down with shovels and in dry weather slightly sprinkled with water. According to F. M. Howlett, who conducted the investigations, the maggots are killed quickly by either a dry or wet heat of 115° F. and will probably not live for long at 106° F. A table is given showing the time required to kill at various temperatures between 108°-122° F., dry and wet; the time is very much shorter for wet than for dry heat, and 12½ minutes sufficed in wet heat at the lowest temperature, whereas no effect was observed in dry. A table of temperatures of the packed manure heaps is given, which shows that so much heat is developed that no larvae can live in them [see this *Review*, Ser. B, iii, p. 197 and iv, p. 22]. The ground on which the manure is to be stacked should be either cemented over or prepared by mixing 1 part by volume of mineral-wood-preserving oil with 40 parts of fine soil, spreading the mixture on the ground and beating it down; 1 gallon of oil will suffice for 100 square feet. Close packing does not seriously affect the value of the manure.

Hirst (S.). **Notes on Parasitic Acari.**—*Jl. Zool. Research, London*, i, no. 2, June 1916, pp. 59-89, 14 figs.

The following species of Acari occur in Britain:—Gamasidae: *Haemogamasus nidi*, Mich., on *Mustela nivalis*, *Apodemus hebridensis*, *Epimys norvegicus*, *Talpa europaea*, and in the nests of *Apodemus* *sylvaticus* and *Mus musculus*; *H. horridus*, Mich., on *A. hebridensis* and in nests of *A. sylvaticus*; *H. hirsutus*, Berlese, on *T. europaea* and *E. norvegicus*; *H. oudemansi*, Hirst, on the brown rat; *Dermanyssus gallinae*, Redi, on fowls, *Bubo maximus* (eagle owl), *Gecinus vaillantii*, and in nests of *Hirundo rustica*, *Columba livia*, *Passer domesticus*, etc.; *D. muris*, Hirst, on *Epimys rattus*; *Myonyssus decumani*, Tir., on *Mus musculus*; *M. gigas*, Oudms., on *Talpa europaea*, and *A. sylvaticus*; *Laelaps agilis*, Koch, on *Arvicola amphibius*, *A. terrestris* and *T. europaea*; *L. pachypus*, Koch, on *A. amphibius* and *Microtus orcadensis*; *L hilaris*, Koch, on *M. orcadensis*, *Mus musculus*, etc.; *L. festinus*, Koch, on *M. musculus*, *Apodemus sylvaticus*, *A. hebridensis*, and *Evotomys glareolus*; *L. echidninus*, Berl., on *Epimys norvegicus*; *Ptilonyssus nudus*, Berl. and Trouess., on the common sparrow.

IXODIDAE: *Ixodes vespertilionis*, Koch, on *Rhinolophus ferrum-equinum*; *I.* sp., near *vespertilionis*; *I. putus*, Cambr., on *Fulmarus glacialis*, *Fratercula arctica* and *Numenius arquata*; *I. unicavatus*, Nm., on *Phalacrocorax graculus*; *I. caledonicus*, Nutt., on *F. glacialis*, *Corvus corax* and *C. cornix*; *I. percavatus*, Nm., var. *rothschildi*, N. and W., on puffin; *I. ricinus*, L., on *Turdus iliacus*, sheep, dog, roe-deer, and man; *I. hexagonus*, Leach, on *Mustela erminea*, *M. nivalis* and dog; *Dermacentor reticulatus*, F., on man.

Two new African Gamasids are described, viz:—*Haemogamasus liberiensis*, on *Mus trivirgatus* from Liberia, and *Haemolaelaps capensis*, on *Georychus hottentotus* from Cape Colony.

BALFOUR (A.). **Fly-Trap for Camps, Hospital Precincts, and Trench Areas.**—*Jl. R.A.M.C., London*, xxvii, no. 1, July 1916, pp. 61–72, 9 figs.

The conditions in Egypt and similar countries render it almost impossible to destroy flies in their breeding places; hence methods have been devised for the capture of adults of *Musca domestica*, *Fannia canicularis* and species of *Calliphora*, *Lucilia* and *Sarcophaga*, which are everywhere abundant. Three traps which are essentially similar in construction, but differ in size, are described. The largest consists mainly of wood, the lower parts of the sides being of wire gauze, so arranged as to provide an entrance for the flies, but at the same time preventing their exit. Shutters, which can be raised over the wire gauze during fumigation, serve, when lowered, as an alighting place for the flies. A glass roof has the effect of warming the trap in early morning, thus rendering it more attractive. A second smaller and more portable form, which is cheaper and recommended for use in camps, consists of wood, canvas, glass and wire gauze. A still smaller type, made of calico and wire gauze supported on a wooden framework, is described. The baits used included jam, milk, sugar, a paste made of lentils, chicken entrails, raw meat, fish refuse, etc. Human excrement, when used, was protected from the flies by meshing. Fumigation was carried out by means of heated Keating's powder, cresol, or a mixture of phenol and camphor. The ground over which the trap is placed should be examined for ova and larvae; if these are present, it should be drenched with crude oil, or 5 per cent. cresol solution. The second form of trap has been found to catch 10,000 flies in 24 hours. A more extensive use of one or other type of trap is recommended, both in Egypt and France.

Ross (J. N. MacBean). **Medical Impressions of the Gallipoli Campaign from a Battalion Medical Officer's Standpoint.**—*Jl. R. Naval Med. Service, London,* ii, no. 3, July 1916, pp. 313–324, 1 chart.

Prophylactic measures against dysentery, diarrhoea and typhoid during the Gallipoli campaign included the destruction of flies, the protection of food and the proper disposal of excreta. Food was kept in tins until required, and during meals plates were covered with gauze. Drinking water was filtered and over-chlorinated before use, and therefore could not be regarded as a carrier of infection. Infection was undoubtedly transmitted by flies to the food consumed, since it was impossible to keep the latter absolutely free from them. Excreta were covered with sand and earth and treated with chloride of lime, while creosol was used for the cleansing of latrines. A liquid " C " was supplied for spraying corpses which lay between the lines of trenches ; this appeared to act as a deterrent, but was not apparently toxic to flies.

Graham-Smith (G. S.). **Observations on the Habits and Parasites of Common Flies.**—*Parasitology, Cambridge,* viii, no. 4, June 1916, pp. 440–544, 17 figs., 8 plates, 5 tables, 9 charts.

The investigations recorded in this paper were carried out at Cambridge between 1913 and 1915. Preliminary experiments in the winter of 1913–14 pointed to the fact that this season is passed through in the pupal stage and further observations during the next winter confirmed the view that the great majority of common flies pass the winter as pupae, or more rarely as larvae which pupate early in spring. The following species were definitely proved to be capable of hibernating in this stage :—*Calliphora erythrocephala, C. vomitoria, Fannia manicata, F. canicularis, F. scalaris, Anthomyia radicum, Tephrochlamys canescens, Blepharoptera serrata, Scatophaga stercoraria, Dryomyza faveola, Nemopoda cylindrica, Piophila vulgaris, Hydrotaea dentipes, Sarcophaga melanura, S. carnaria, Stomoxys calcitrans, Mydaea lucorum, Lucilia caesar, L. sericata, Phaonia erratica, Muscina stabulans, M. pabulorum, Ophyra leucostoma, Polietes lardaria.* A small number of adults of *C. erythrocephala, M. stabulans, M. pabulorum,* etc., emerged on warm days during the autumn and winter and were observed in various situations. It is possible that some of these adults may survive until the spring. Blow-flies kept out of doors under sheltered conditions emerged about 1st January and fed readily on warm days, but became inactive in cold weather. Forty per cent. of the total number survived until 4th April, and in May larvae were reared from their eggs. Females emerging in autumn or winter probably do not reach sexual maturity much earlier than those which emerge in spring. Emergence from the pupa depends mainly on the temperature, and in all probability transformation takes place only after the materials in which the pupae pass the winter have reached a certain critical temperature, which differs in various species. For *C. erythrocephala, F. manicata* and *F. scalaris,* this temperature is from 48° to 50° F., for *Ophyra* about 58° F., and for *Muscina* about 63° F. In those cases in which flies appear very early in the year, it is probable that the " nymph " stage is reached during the previous autumn and the adults are ready to emerge as soon as the temperature approaches the critical point. On the other hand, on many warm days no emergence whatever took place.

Data were obtained on the rate of multiplication of blow-flies. The number of descendants of each female kept under open-air conditions, and protected as far as possible from enemies, was about 130 during the season. Under natural conditions it may be assumed that this number is still smaller. The average duration of the life-cycle in summer during these experiments was 30 days. The low rate of increase observed, as compared with the theoretical rate discussed by Howard, seemed to be almost entirely due to a high mortality occurring among newly emerged flies of generations subsequent to the winter one, individuals of which showed great powers of endurance. No definite conclusions can yet be drawn as to the cause of the mortality observed, but it was found that the death of many flies occurred after wet, cold and windy days and of still more in hot weather, or as a result of direct exposure to the sun.

Records were made during the seasons of 1914 and 1915 of the species entering rooms. The following were observed:—PSYCHODIDAE, SYRPHIDAE, *Platystoma seminationis*, *Tephrochlamys canescens*, *Blepharoptera serrata*, *Scatophaga stercoraria*, *Fannia manicata*, *F. armata*, *F. scalaris*, *Azelaria macquarti*, *Hydrotaea irritans*, *Anthomyia pluvialis*, *Digonochaeta spinipennis*, *Microchrysa polita*, *Sargus cuprarius*, *S. iridatus*, *Thereva plebeia*, *Lonchaea vaginalis*, *Helomyza olens*, *Mydaea urbana*, *M. obscurata*, *M. meditabunda*, *M. impuncta*, *M. uliginosa*, *Coenosia tigrina*, *Pegomyia bicolor*, *Phaonia variegata*, *P. erratica*, *Chortophila fugax*, *Graphomyia maculata*, *Musca autumnalis* (*corvina*), *Brachycoma devia*, *Phryxe vulgaris* and *Voria ruralis*. The majority of these enter houses accidentally, but *C. erythrocephala*, *S. calcitrans*, *F. canicularis*, and *M. domestica* do so for a definite purpose. *C. erythrocephala* is attracted by food on which to oviposit. *S. calcitrans* enters for shelter and may occasionally attack persons in the room. *F. canicularis* is numerous throughout the season, but it is probable that the individuals do not remain long indoors. *M. domestica* enters houses persistently and remains indoors until ready to oviposit. The first six individuals of *M. domestica* observed to enter a room appeared in 1915 on 6th June, five of which were males. All were newly emerged, a fact which supports the view that the winter is passed in the pupal stage. Between June and September the captures in the same room included 60 per cent. males, while in October 60 per cent. were females. During this month the flies tended to remain in the room for much longer periods. House-flies kept outside in cages laid few eggs, the temperature conditions being apparently unfavourable. No eggs were ever found to be deposited on food in kitchens.

Observations on the habits of various flies under natural conditions showed that the form and situation of the traps, the baits used, the weather conditions, and the season of the year, all influenced the number and species of flies captured. The traps, which were of the mosquito-net and galvanised iron types, were placed in different positions and were baited with human excrement, decaying animal matter, or fruit. Traps in the open, baited with excrement or decomposing animal matter, attracted 39·5 per cent. and 37·6 per cent. respectively of the total number caught; dark receptacles in open situations caught

10·6 per cent. and 5·9 per cent. respectively, those in shady places attracted 3·6 per cent. on excrement and 2·4 per cent. on animal matter. It is therefore recommended that manure, etc., should be kept in shady situations. Several species, including *C. erythrocephala*, *C. vomitoria*, *F. scalaris*, *L. caesar* and *M. stabulans*, which visit both excrement and animal matter, seldom enter houses and are thus of little importance as carriers of disease in this country. They may however be very important under war conditions. *Pyrellia eriophthalma*, *Pseudopyrellia cornicina*, *Morellia hortorum*, *Polietes lardaria* and *Scatophaga* frequent excrement, but seldom visit animal matter. Species belonging to the genera *Calliphora*, *Lucilia*, *Muscina*, *Sarcophaga*, *Hydrotaea*, and *Polietes* are seldom found in shady places, while *Phormia groenlandica*, *P. cornicina*, *M. hortorum* and *Ophyra leucostoma* are entirely absent from such situations. Small ANTHOMYIDAE however are abundant. With regard to seasonal abundance, *P. groenlandica* appeared early in June, was numerous in September, and disappeared at the end of October. *Lucilia* spp. appeared in May, increased in numbers until the beginning of September, then decreased rapidly. Isolated individuals of *P. eriophthalma* occurred in February and March, and larger numbers in May and June. Few specimens were then found until October. *P. cornicina* occurred in small numbers between June and September, and was abundant during October. The seasonal distribution of the following species is also noted :—*Pollenia rudis*, *M. autumnalis*, *M. stabulans*, *M. hortorum*, *S. calcitrans*, *Sarcophaga* spp., *Onesia cognata*, *Hydrotaea dentipes*, *P. lardaria*, and *O. leucostoma*. Of the total number of flies visiting the traps, 16 per cent. were males, while in the dark receptacles only 5 per cent. were males. In the cases of *C. erythrocephala*, *C. vomitoria* and *Lucilia*, both males and females visited excrement placed in the open only for the purpose of feeding, while oviposition took place in excrement placed in dark receptacles. Young specimens of *Lucilia* were attracted to human excrement for food. Ripe fruit proved attractive to those species which visited excrement and animal matter, but in this case males formed 38 per cent. of the total number captured. Cultures made from fruit which had been exposed to wasps and flies showed the presence of *B. coli*, thus proving that fruit is liable to contamination by these insects. Only 10 specimens of *M. domestica* were captured in the traps, two being found in the galvanised iron type placed in the open and baited with animal matter and the remainder in the fruit trap.

The larvae of some species, especially in the later stages, tend to migrate, even though the food supply is abundant. Those of *H. dentipes*, *M. stabulans*, *Graphomyia maculata*, *Polietes albolineata*, *Phaonia erratica* and *Azelia macquarti* are predaceous on the larvae of other species. Many species can develop in buried carcases, and when mature, are able to reach the surface of tightly-packed earth, undergo pupation, and emerge as adults. The burial of carcases has however the effect of preventing the deposition on them of large numbers of eggs. The baits used in the traps proved attractive to various species of wasps, as did also animal carcases exposed in an open field. Blowflies feeding on the carcases were frequently captured by them, and as their legs and mouth-parts must therefore become contaminated, it is probable that they disseminate pathogenic and putrefactive bacteria.

A disease due to the fungus, *Empusa*, is known to attack *M. domestica* under indoor conditions during the autumn. Two infected females of *F. canicularis* were found in a room on 15th and 23rd October, while a number of *C. erythrocephala* in experimental cages were infected between 18th September and 12th November. Examples of *H. dentipes* dead of this disease were found out of doors on four occasions, the first being on 30th August, i.e., before infection was observed among *M. domestica.* Adults of *M. domestica* emerging from pupae kept under external conditions and protected from contact with other large flies showed the first signs of infection on 11th October. Between this date and 23rd October, 27 per cent. died of the disease, while a second period of high mortality occurred between 8th and 16th November, when 43 per cent. died. Contact with infected individuals of the same species is therefore not necessary to produce contamination. Infection must have taken place (1) in the larval stage, before introduction into the cages; (2) through the agency of mites or very small insects; or (3) by spores carried by the wind. The growth of the fungus seemed most rapid in warm, damp weather, but took place at a considerable rate when the temperature was low, since a fly which showed the first signs of infection on 16th November developed the characteristic bands two days later. Two species of mites were frequently found attached to various flies. *Holotaspis* sp., which occurred either singly or several together on any part of *M. domestica, O. leucostoma, H. dentipes* and *M. stabulans*, remained attached for periods up to 192 hours, and was apparently parasitic; specimens of *M. stabulans* infected by this mite were found as early as 26th April. A species of *Gamasus*, allied to *G. coleoptratorum,* was abundant between August and October, and plentiful also through the winter on animal matter upon which the larvae were feeding. This species was generally found attached to weak or dead flies, and in the latter case seemed to feed on the bodies. Larval Nematodes were often attached to the legs of the mites, but whether these are transmitted to the flies was not determined. Hypopial nymphs belonging to the genus *Tyroglyphus* and adults of *T. siro* were found on some adults and in empty puparia respectively. These may have served as food for *Gamasus* sp. Pseudo-scorpions belonging to the order Chernetidea were common in 1915; *Chelifer nodosus*, Schr., was found attached to the legs of *M. domestica, M. autumnalis, O. leucostoma,* and *L. vaginalis* during the summer and autumn and *C. scorpioides* on *Stomoxys calcitrans* in October. The duration of the attachment varied from one to four days. The puparia of various species were found to be attacked by Braconid and Chalcid parasites. The Braconids, *Alysia manducator* and *Aphaereta cephalotes*, pass the winter as larvae in the puparia of *C. erythrocephala* and other flies. From puparia kept in the shade, blow-flies emerged between 23rd April and 11th May and specimens of *A. manducator* between 17th May and 16th June, and in much greater numbers between 19th September and 15th October. The first period of emergence coincided with the time of oviposition of adults arising from overwintering pupae. Puparia kept in the sun showed parasitism by Braconids and by Chalcids, especially *Melittobia acasta*, Wlk.; a Pteromalid was also present in a few cases. *M. acasta* did not infest puparia kept in the shade, but appeared in puparia transferred from the shade to a sunny position on 29th April. Further observations pointed to the fact that parasitism by the Chalcid took place after 29th April. The extent of infection by Braconids, in the absence of Chalcids, reached 90 per cent. These parasites are therefore of great importance in limiting the numbers of flies. The Chalcid, *M. acasta*, was always found in puparia which were already attacked by a Braconid and this species may therefore be a hyperparasite. In one case the egg of *M. acasta* was found attached to the abdomen of a pupa of *Aphaereta cephalotes* within a fly puparium. The life-cycle of *M. acasta* occupies about a month. Hibernation takes place in the larval stage in the fly puparium.

PARKER (R. R.). **Dispersion of** ***Musca domestica*****, Linnaeus, under City Conditions in Montana.**—*Jl. Econ. Entom.*, *Concord*, ix, no. 3, June 1916, pp. 325–354, 7 plates, 4 tables.

This paper gives details of the experiments recorded in a paper already abstracted [see this *Review*, Ser. B, iv, p. 78].

A bibliography of 11 works relating to the subject of fly dispersal is appended.

EVANS (A. T.). **Some Observations on the Breeding Habits of the Common House-Fly,** ***Musca domestica*****, Linnaeus.**—*Jl. Econ. Entom.*, *Concord*, ix, no. 3, June 1916, pp. 354–362.

Musca domestica was found to breed readily in fresh horse manure, rarely in cow manure, and in one instance only in garbage. The migration of the larvae to the outer layers of manure heaps was observed. Failure to oviposit in garbage was shown to be due to the acid nature of this substance. Manure, when tested, was found to be alkaline ; samples which had been standing for 30 minutes contained 0·647 per cent. of ammonia, but this quantity decreased as the exposure became more prolonged. The percentage of acid in garbage varied, but on an average was sufficient to neutralise an equal quantity of ammonia of a strength of 0·653 per cent. Eggs and larvae were able to develop normally in manure soaked with ammonia up to a strength of 0·7 per cent., but practically no development took place in the presence of hydrochloric acid, even when very dilute. Pupae placed in earth moistened with distilled water, 0·75 per cent. acid, or 2·1 per cent. ammonia, completed their metamorphosis in a normal manner. Oviposition took place on old rags which had been previously moistened ; the larvae hatching from these eggs migrated from the rags in the absence of a food supply. Attempts to induce egg-laying in manure moistened with liquid from garbage met with negative results. In all the experiments it was noted that the larvae were sensitive to excess of moisture, while in manure heaps and bins they were always present in the drier portions only. The scarcity of larvae in cow dung may be attributed to the saturated nature of this substance. Adult flies which occurred abundantly near garbage seemed to visit it for feeding purposes only.

The larvicidal properties of hydrochloric acid at a strength of from 0·75 to 1·0 per cent. suggest its value as a spray for use against the breeding places of flies.

IMES (M.). **Sheep Scab.**—*U.S. Dept. Agric., Washington, D.C,*, Farmers' Bull. no. 713, 17th April 1916, 36 pp. 21 figs. [Received 12th July 1916.]

The first part of this paper contains an account of the cause, means of spreading, and effects of scabies in sheep. The remainder is occupied by a description of dipping tanks and fluids used in the treatment of the disease. Two dippings at an interval of from 10 to 14 days are necessary for the eradication of sheep scab. The dips in general use in the United States are lime-sulphur, and nicotine and sulphur. The former is prepared according to the formula :—8 lb. unslaked lime, 24 lb. flowers of sulphur, 100 U.S. gals. water. A paste consisting of the lime, sulphur and a little water is made up to 30 gals., and this quantity is then boiled for two hours. After being allowed to settle, the clear liquid is run off and made up to 100 gals. The concentrate thus obtained is diluted 3⅓ times before use. The temperature of this dip in the tank should be maintained at 100° to 105° F. The second dipping fluid is prepared from 16 lb. flowers of sulphur, ⅖ lb. nicotine (40 per cent. solution), and 96 gals. water ; the temperature in the tank should not be raised above 110° F.

GOLDSMID (J. A.) & CROSSE (W.). **Some Notes on Dengue.**—*Med. Jl. Australia, Melbourne*, 6th May 1916, pp. 377–378. [Received 11th July 1916.]

The outbreak of dengue at Murwillumbah, New South Wales, which is discussed in this article, was coincident with the appearance of *Stegomyia fasciata* in the affected district. The first definite diagnosis of the disease was made about 10th February and between that date and 10th April it was very prevalent.

WYLER (E. J.). **Four Reports on Yellow Fever in Nigeria during 1913.** —*Rept. Yellow Fev. Commiss.* (*West Africa*) ; *Yellow Fev. Bur. Bull., Liverpool*, Supplement i, May 1915, pp. 1–196, 7 plates, 79 charts, 5 plans, 1 map. [Received 10th July 1916.]

These reports contain an account of the conditions as regards *Stegomyia fasciata* in various Nigerian towns which had been visited by persons in whom yellow fever was detected. Larvae were commonly found in the numerous earthen jars used for storing water in native houses, water-tanks attached to European dwellings being infected to an extent of 88 per cent. At Warri, anti-mosquito measures were carried out under the direction of sanitary officers and larvae of *Stegomyia* were rare. Screening of wells, tanks, etc., was carried out at Forcados and Burutu, and at the time of investigation few larvae were found. They were however abundant in an unreclaimed swamp a short distance away, the water of which contained chlorides equivalent in amount to 4·74 per cent. of common salt. The river craft, and probably also the swamp just mentioned, constituted the main source of supply of *S. fasciata.* Ocean-going and river steamers afforded facilities for the transit of *Stegomyia.* Twelve cases of yellow fever were definitely diagnosed on ocean-going vessels in 1912 and 1913, but in those ships in which single cases of fever occurred, the patients were probably infected whilst ashore. There is no evidence that yellow fever has been introduced into Nigeria from a neighbouring dependency.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 89, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.

The Louse Problem on the Western Front 133
Experiments in Controlling Lice 133
The Relations between Lice and Recurrent Fever 134
The Destruction of Mosquitos with vaporised Creolin 134
The Prevention of Malaria in Germany 134
The Destruction of Lice, etc., with Hydrocyanic Acid in Australia 135
Stegomyia fasciata and Yellow Fever in Australasia 135
The Control of Lice 135
The Mosquitos of Mecklenburg County, North Carolina 136
Transmission of Tertian Malaria in the U.S.A. 136
The Value of Gyrinid Beetles in destroying Anopheline Larvae in the U.S.A. 137
Legislative Measures against Rats in Louisiana 137
The Transportation by Man of Disease-carrying Insects 137
Hippoboscids infesting Brazilian Birds 137
The Bionomics of Flies causing Myiasis in Africa 138
The Hypothesis of the Transmission of Endemic Goitre by a biting Insect in Algeria 139
Malaria and Mosquitos in Flanders 139
The Control of Cockroaches in Houses in Britain 140
The Destruction of Cockroaches 140, 141
The Control of Flies in Manure Heaps 141
Notes on parasitic Acari in Britain 141
Fly-Traps for Camps, etc. 142
Flies and Disease in Gallipoli 143
The Bionomics of Common Flies in Britain 143
The Dispersal of the House Fly in Towns in the U.S.A. 147
The Breeding Habits of the Common House-Fly in the U.S.A. .. 147
The Preparation of Dips for Sheep Scab in the U.S.A. 148
Notes on Dengue in New South Wales 148
Stegomyia fasciata and Yellow Fever in Nigeria 148

VOL. IV. Ser. B. Part 10.—pp. 149-164. OCTOBER, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

Smithsonian Institution
NOV 1916
National Museum

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., ***Chairman.***

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.

Mr. E. E. Austen, Entomological Department, British Museum (Natural History).

Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.

Mr. E. C. Blech, C.M.G., Foreign Office.

Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.

Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.

Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.

Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).

Professor H. Maxwell Lefroy, Imperial College of Science and Technology.

The Hon. Sir John McCall, M.D., Agent-General for Tasmania.

Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.

Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.

Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.

Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.

Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.

Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.

Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.

Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.

Mr. H. J. Read, C.B., C.M.G., Colonial Office.

The Honourable N. C. Rothschild.

Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.

Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.

Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.

Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.

Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.

Dr. Guy A. K. Marshall.

Assistant Director.

Mr. S. A. Neave.

Assistant Editor.

Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.

Publication Office.—89, Queen's Gate, London, S.W.

Dengue Fever.—*Med. Jl. Australia, Melbourne*, 6th May 1916, p. 380. [Received 11th July 1916.]

Investigations carried out by Dr. J. B. Cleland in connection with a recent outbreak of dengue fever in Murwillumbah, New South Wales, have led that observer to the conclusion that the disease differs from the Syrian type of dengue in the length of the incubation period, and that it may be a mutant of yellow fever, associated with *Stegomyia fasciata* as a carrier of infection. The conclusions of Dr. Cleland are criticised as being based on insufficient experiments. It is stated that there is no evidence for the view that dengue is a mutant of yellow fever, nor has the incubation period been definitely proved to be seven days, but may be either four or eight days.

LEONARD (T. M. R.). **Report on Certain Outbreaks of Yellow Fever in Lagos, 1913, and January and February 1914.**—*Rept. Yellow. Fev. Commiss. (West Africa)*; *Yellow Fev. Bur. Bull., Liverpool*, Supplement i, May 1915, pp. 207–316, 38 charts, 1 map. [Received 10th July 1916.]

Thirty-eight cases of yellow fever were recorded during the period under consideration, eighteen being among non-immune races (European and Syrian) engaged in mercantile or seafaring occupations. Mercantile communities are brought into close contact with natives, while among sailors, infection has been contracted at ports in the Colony other than Lagos. The present and previous records tend to support the view that yellow fever is endemic in Nigeria, implying that infection among natives spreads to some extent and that infected cases, if they recover, acquire an immunity. Endemicity and immunity proceed simultaneously, and in the foci of infection epidemics may occur from time to time.

O'BRIEN (J. M.). **Report on a Visit to Guayaquil.**—*Rept. Yellow Fev. Commiss. (West Africa)*; *Yellow Fev. Bur. Bull., Liverpool*, Supplement i, May 1915, pp. 317–352, 11 charts. [Received 10th July 1916.]

The limited water supply at Guayaquil, Ecuador, and the consequent necessity for water storage, affords favourable conditions for the breeding of *Stegomyia fasciata*. The screening of cisterns is rarely carried out. The inhabitants themselves are immune to yellow fever, but the disease is maintained by the constant influx of non-immunes from the mountains. The absence of fever among young children was marked, and it was also observed that this immunity decreased in later years.

DALZIEL (J. M.) & JOHNSON (W. B.). **Notes on a Visit to Sherbro District.**—*Yellow Fever Bur. Bull., Liverpool*, Supplement ii, August 1915, pp. 527–540. [Received 11th July 1916.]

Sherbro District, on the coast of Sierra Leone, was visited during the month of February, i.e., during the last part of the rainless season. *Stegomyia fasciata* was absent from all the localities investigated.

(C312) Wt.P1/106. 1,500. 10.16. B.& F.Ltd. Gp.11/3. ▲

In the Bonthe district the following blood-sucking Diptera were captured :—*Uranotaenia annulata*, Theo. ; *Culex insignis*, Cart. ; *C. decens*, Theo. ; *C. tigripes*, Grp. ; *C. consimilis*, Newst. ; *C. duttoni*, Theo. ; *Culiciomyia nebulosa*, Theo. ; *C. freetownensis*, Theo. ; *Mansonioides uniformis*, Theo. ; *Taeniorhynchus annettii*, Theo. ; *Ochlerotatus nigrocephalus*, Theo. ; *O. caliginosus*, Graham ; *Glossina palpalis*, R. D. ; *Tabanus fasciatus*, F. ; *T. congoensis*, Ric. ; *T. obscurissimus*, Ric. ; *Hippobosca* sp. ; *Phlebotomus duboscqi*, N.L., and *Culicoides* sp.

Larvae of the following mosquitos were found in crab-holes, at the roots of trees, etc. :—*U. annulata*, *C. decens*, *C. tigripes*, *C. duttoni*, *C. freetownensis*, *O. nigrocephalus*, *Anopheles costalis* and *A. funestus*.

DALZIEL (J. M.) & JOHNSON (W. B.). **Report on Yellow Fever Investigation in Freetown. September 1913 to March 1914.**—*Yellow Fever Bur. Bull.*, *Liverpool*, Supplement ii, August 1915, pp. 541–579, 8 tables, 1 chart. [Received 11th July 1916.]

Investigations into the presence of yellow fever in Freetown were based on the assumption that *Paraplasma flavigenum* is the virus of the fever and can be demonstrated in the blood of fever patients. One case of yellow fever in a European was definitely diagnosed, while several others were found on suspected ships. Malaria was present in 48 per cent. of the cases examined.

Rats were found to be infected with the fleas, *Xenopsylla cheopis*, Roths., and *X. brasiliensis*, Baker. The louse, *Polyplax spinulosus*, Burm., and a Gamasid mite, *Laelaps* sp. near *echidninus*, Berl., were less common. Trypanosomes of the *T. lewisi* type were present in the blood of 60 per cent. of the rats examined. Stray dogs were attacked by the flea, *Ctenocephalus canis*, Curt., and by the ticks, *Rhipicephalus sanguineus*, Latr., *R. simus*, Koch, and a larval *Amblyomma*.

During March, larvae of the following mosquitos were collected in the town :—*Culex decens*, Theo. ; *C. duttoni*, Newst. ; *C. tigripes*, Grp. ; *Stegomyia fasciata*, F. ; *Anopheles costalis*, Theo. ; *Culiciomyia nebulosa*, Theo. *S. fasciata* formed 14 or 15 per cent. of the total number of larvae. Adult mosquitos included *S. fasciata*, *C. nebulosa* and rarely *A. costalis*.

Clinical investigations during this period tend to show that yellow fever no longer maintains an endemic persistence in Freetown. As yet no endemic focus in Sierra Leone has been demonstrated ; it is possible that no particular sea-port may be involved, but rather that the focus may be found in the holds of merchant ships. Inspection of ships for the presence of *Stegomyia* is to be undertaken.

FOWLER (Sir J. K.), SIMPSON (W. J.), ROSS (Sir R.), LEISHMAN (Sir W. B.) & BALFOUR (A.). **Third Report of the Yellow Fever Commission (West Africa).**—*London*, 1915, 51 pp. [Received 10th July 1916.]

This report summarises the main facts at present known concerning the virus of yellow fever. It is undoubtedly transmitted by *Stegomyia fasciata*, and it is not known to be carried by any other agent under normal conditions. The period required for its development in the mosquito is approximately 12 days. The blood of a yellow fever patient is probably not infectious after the third day. The evidence as to *Paraplasma flavigenum* being the causal agent is discussed at length, and the report ends with the conclusion that no proof has been given that these bodies are of a Protozoal nature and that a number of microscopic objects are included under the name. There is as yet no reason to regard any of these as the cause of yellow fever, and the nature of the virus of this disease still remains undetermined.

SINCLAIR (J. M.) **Veterinary Report.**—*Rhodesia Agric. Jl., Salisbury*, xiii, no. 3, June 1916, pp. 400–402.

During March and April, fresh outbreaks of African coast fever were reported from the Melsetter District in Rhodesia. In the latter month blood smears from donkeys working in the Hartley District showed the presence of *Trypanosoma brucei* var. *rhodesiense*. The affected animals were destroyed. A number of cattle in the Gwelo district showed trypanosomes. No species of *Glossina* has been found within 40 miles of the infected area and it is therefore suggested that some other carrier may have transmitted the disease from animals which had previously passed through an infected district.

O'DEA (M. E.). **Annual Report on the Veterinary Department for the Year 1915.**—*Accra, Gold Coast*, 1916, 8 pp., 3 tables. [Received 18th July 1916.]

No tsetse-flies were observed in Kumasi during the year, but it is possible that in the near future they may be brought in with cattle which pass through the fly-belts before reaching the town. About 90 per cent. of these animals show the presence of trypanosomes in the blood. Tabanids occur in small numbers and *Stomoxys* is found in or near stables in which horses are kept.

WAGNER (J.). **Къ познанію фауны Кавказскихъ** Suctoria. [Contribution to a fauna of Caucasian Suctoria.] — **« Извѣстія Кавказскаго Музея.»** [*Bulletins of the Caucasian Museum*], *Tiflis*, x, no. 1, 1916, pp. 54–64, 8 figs.

The following list of fleas is given :—*Pulex irritans*, L., found both in Caucasia and in Persia ; *Archaeopsylla* (*Ctenocephalus*) *erinacei*, Bch., on *Erinaceus* sp. ; *Ctenocephalus felis*, Bch., on lynx in Persia ; *C. canis*, Curt., on *Vulpes alpherakyi* ; *Ceratophyllus columbae*, Gerv., on owls ; *Amphipsylla schelkovnikovi*, Wagn., on *Microtus* sp. ; *Ctenophthalmus spalacis*, Rothsch., on *Spalax microphthalmus* ; *C. inornatus*, sp. n., on *Prometheomys schlaposchnikovi* ; and *Hystrichopsylla satunini*, sp. n., and *Vermipsylla hyaenae*, Kol., on *Hyaena vulgaris*.

It is pointed out that the males of *A. schelkovnikovi* closely resemble those of *A. certa*, Rothsch., and it is considered probable that the latter is only a local variety of the former.

WASHBURN (F. L.). **The Malarial Mosquito Harmless in Minnesota.**—*Minnesota Insect Life, St. Anthony Park,* iii, no. 10, 1st July 1916, p. 3.

Control measures against Anophelines are being successfully carried out in a localised area in Minnesota. Experiments on the feeding habits of the species present have shown that they do not carry malaria in this State.

KING (W. V.). **Experiments on the development of malaria parasites in three American species of** *Anopheles.*—*Jl. Experim. Med., Baltimore,* xxiii, no. 6, 1st June 1916, pp. 703–716, 8 plates.

Experiments have shown *Anopheles punctipennis* to be an efficient host of the organisms of tertian and aestivo-autumnal malaria and *A. crucians* of aestivo-autumnal malaria at least. Information has also been obtained as to the relative susceptibility of these two species and of *A. quadrimaculatus,* which has been considered to be the principal species concerned in the transmission of malaria in the United States.

With *A. punctipennis,* developmental forms of the exogenous or sporogenic cycle of *Plasmodium vivax* were demonstrated in six (85 per cent.) of the seven mosquitos dissected, and the development of *P. falciparum* in four (20 per cent.) of twenty specimens. As these four infections occurred in a series of thirteen specimens fed on one person, the percentage was actually 33. With *A. crucians,* oocysts or sporozoites or both oocysts and sporozoites of *Plasmodium falciparum* were found in nine (75 per cent.) of the twelve specimens dissected. No tests were made with this series and *P. vivax.* *A. quadrimaculatus* was employed as a control species in the experiments and became infected in the following ratio: Eight (66 per cent.) of twelve specimens with *P. vivax,* and three (15 per cent.) of nineteen specimens with *P. falciparum.*

In determining the relative susceptibility of the three species only those individuals which had been fed upon the same gamete carriers are considered. The number of mosquitos from which the percentages are computed is too small to make the results entirely conclusive, but the indications are that *A. punctipennis* and *A. quadrimaculatus* are equally susceptible to infection with *P. vivax,* 85 per cent. of each species under the same conditions being positive. With *P. falciparum,* *A. crucians* showed the highest percentage of infection (75 per cent.), *A. punctipennis* second (33 per cent.) and *A. quadrimaculatus* third (23 per cent.).

BERTOLIO (S.) & MARIANI (A.). **Contributo sperimentale allo studio della profilassi anti-anofelica.** [An experimental contribution to the study of mosquito-destruction.] — *Morgagni, Milan,* lvii, Part 1, no. 7, July 1915, pp. 259–265. [Received 24th July 1916.]

Owing to the high price of petrol, experiments were made with heavy oil of a density of 0·925, such as is used in Diesel engines, as a larvicide in anti-mosquito work. A mixture of nine parts of such oil with one of petrol proved satisfactory. It should be poured upon the water on a hot, calm day, so that it may spread uniformly. The film lasts so long that two applications a year are sufficient, whereas petrol requires renewing once a fortnight. In Italy the cost of this mixture is about one-tenth that of pure petrol. An Italian heavy oil, of a density of 0·785, gave equally good results. The disadvantages of such a film are its liability to kill fish and to clog the plumage of water-birds.

BERTARELLI (E.). **La lotta contro il tifo esantematico.** [The control of exanthematous typhus.]—*Morgagni, Milan*, lvii, Part 2, no. 22, April 1915, pp. 343–348. [Received 24th July 1916.]

A general account of a typhus fever epidemic is given and emphasis is laid on the transmission of the disease by lice, against which the first prophylactic measures should be directed. By working along these lines, the number of cases in Tunis was reduced from 856 in 1909 to 3 in 1914.

BERTARELLI (E.). **I punti controversi della epidemiologia del tifo esantematico.** [Controversial points in the epidemiology of exanthematous typhus.]—*Morgagni, Milan*, lvii, Part 2, no. 37, July 1915, pp. 585–591. [Received 24th July 1916.]

The various controversies relating to typhus fever, especially with regard to its transmission, are here dealt with. Lice [*Pediculus humanus*] must certainly be held to be the most common transmitters of the disease, though other ectoparasites may also be concerned in its conveyance to man. Insect transmission accounts for the rapid spread of epidemics.

BERTARELLI (E.). **Gli insegnamenti della lotta profilattica contro il tifo esantematico.** [The lessons derived from prophylactic measures against exanthematous typhus.]—*Morgagni, Milan*, lviii, Part 2, no. 10, February 1916 pp. 145–156. [Received 24th July 1916.]

A useful summary of the prophylactic measures adopted in different countries against lice is embodied in this paper. Since March 1915 the Italian authorities have adopted the following mixture for destroying *Pediculus humanus* and *P. capitis*: Petrol, 100 parts; olive oil, 50 parts; balsam of Peru, 10 parts. A useful preventive consists of oil of aniseed or oil of fennel, 30–40 parts, and alcohol (96 per cent.), 40–60 parts. In March 1915 the Austrian army orders recommended naphthaline in body sachets and a mixture containing 30–40 parts of oil of aniseed, with or without bergamot, for freeing the skin from lice.

GRIXONI (G.). **La difesa contro i pidocchi.** [Louse control.]—*Giornale Med. Milit., Rome*, lxiv, no. 6, 30th June 1916, pp. 417–430. [Received 2nd August 1916.]

In this review of the various methods and materials used in louse control it is pointed out that the choice of a given means will depend considerably on local conditions and that the results will therefore vary. In the Italian army, Captain Izar has suggested fumigation with a mixture of naphthobenzol and ammonia consisting of a saturated solution of ammonia gas in benzine, with 5 per cent. naphthaline added, and heated to 104°–121° F. This has given good results, even in cases where clothing has been piled up in masses.

Hay (G. G.). **First Measures in Malaria Prevention for Farmers and Settlers. The Rôle of Nature in the Suppression of Malaria.**—*S. African Anti-Malarial Association, Johannesburg.* The War on the Mosquito: Publication no. 11, 45 pp., 20 figs.

This booklet gives practical advice as to malaria prevention. The cause of malaria, the manner of its transmission and the usual permanent sources of infection for Europeans are explained. The appearance and habits of mosquitos and their larvae are described. Advice on the choice of sites for building with a view to escaping and suppressing mosquitos is given. Screening, mosquito-nets, hygiene and quinine prophylaxis are also dealt with.

Hay (G. G.). **Malaria Prevention on Active Service. Notes for the Information and Guidance of the Union Troops on Service in Central and East Africa.** [Also in Dutch.]—*S. African Anti-Malarial Association, Johannesburg.* The War on the Mosquito: Publication no. 14, 18 pp., 6 figs.

This booklet deals in simple language with the nature of malaria and its manner of transmission. The habits and appearance of Anopheline mosquitos are described. Mosquito-nets and other means of protection are dealt with.

Wolbach (S. B.). **The etiology of Rocky Mountain spotted fever. A preliminary report.**—Reprint from *The Journal of Med. Research, Boston,* xxxiv, no. 1, March 1916, pp. 121–126, 1 plate. [Received 8th August 1916.]

When examples of *Dermacentor venustus* of both sexes infected with the virus of Rocky Mountain spotted fever were fed on guinea-pigs, these developed symptoms characteristic of the disease.

McCaffrey (D.). **The effect of tick bites on man.**—*Jl. of Parasitology, Urbana, Ill,* ii, no. 4, June 1916, pp. 193–194.

The constitutional symptoms in a case of tick-bite are described, the tick having been identified as *Dermacentor venustus.* A description of the local symptom in two other cases is given in which it is uncertain whether *D. venustus* or *D. albipectus* was involved.

Kitano (Toyojiro). **The employment of rat poison as a measure for preventing and exterminating the plague.**—*Amer. Jl. Trop. Dis. & Prev. Med., New Orleans,* iii, no. 12, June 1916, pp. 627–659.

The manner in which rat poison was employed in Yokohama as an anti-plague measure is described. Continued distributions of large quantities of phosphorus to every house in the city were made.

Phosphorus is the most effective rat poison, arsenic coming next. Danger to human life can be obviated by care in distribution. These poisons cause plague-infested rats to die so rapidly that the virus is unable to become widely spread. Phosphorus rat-poison retains its effectiveness for more than twenty days and arsenic rat-poison even longer. Distribution is simple and economical when compared with other preventive measures, and neither commercial nor industrial enterprises are interfered with. The more widely the poison is distributed to every house the better the results ; where the poisons were distributed to several houses in a locality no rat could be found there. It was found that the bacteria in the dead body of the rat are naturally destroyed within from two to twelve days when the temperature is low, and the body of the rat decays.

Creel (R. H.) & Faget (F. M.). **Cyanide gas for the destruction of insects.**—*U. S. Public Health Repts., Washington, D.C.*, xxxi, no. 23, 9th June 1916, pp. 1464–1475.

A series of practical experiments have been conducted in order to determine the comparative insecticidal values of cyanide gas and sulphur dioxide. During the tests, the outdoor temperature varied from 33° to 70° F., but with no noticeable difference in results. The standards arrived at are provisional, applying to generally existing conditions and not to extraordinary or unusual situations. For instance, while it is believed that cyanide gas in the proportion of 2½ oz. of potassium cyanide per 1,000 cubic feet, exposure for one hour, will destroy fleas in the majority of instances, such a strength would hardly kill these insects were they lodged in tightly packed luggage, which would require to be opened and to have its contents spread out. For routine fumigation the following proportions per 1,000 cubic feet of space are recommended. For mosquitos : Potassium cyanide, 0·4 oz. for 15 minutes ; sulphur, 2 lb. for one hour. For bedbugs : Potassium cyanide, 5 oz. for one hour. For body lice : Potassium cyanide, 10 oz. for two hours ; sulphur, 4 lb. for six hours. For cockroaches : Potassium cyanide, 10 oz. for one hour ; sulphur, 4 lb. for six hours. For fleas : Potassium cyanide, 2½ oz. for 15 minutes. For fleas and rats a standard of 5 oz. cyanide or 4 lb. sulphur has already been recommended [see this *Review*, Ser. B, iv, p. 25]. The unit price of cyanide fumigation in the proportion of 5 oz. cyanide per 1,000 cubic feet was 4½*d.* at the prices then ruling (12½*d.* per lb. for potassium cyanide and 7*d.* per lb. for sulphuric acid). The price for sulphur fumigation was 5*d.* at the strength of 4lb. per 1,000 cubic feet. Cyanide fumigation costs only one-ninth of sulphur fumigation in the case of mosquito destruction, apart from occupying much less time. Furthermore the dilution of the cyanide gas after diffusion is such as practically to eliminate all danger to human life. For destroying bedbugs, cockroaches and body lice, sulphur is a cheaper fumigant than cyanide, but the latter possesses obvious advantages. The detailed results of these experiments are given in a series of ten tables.

Bezzi (M.). **Una nuova specie di Estride dell' Eritrea.** [A new species of Oestrid from Eritrea.]—*Boll. Lab. Zool. Gen. Agrar. R. Scuola Sup. Agric., Portici*, x, 1915–1916, pp. 27–32.

Some Diptera from Eritrea, said by the natives to transmit trypanosomiasis of the horse, ox and camel, included *Hippobosca camelina*, Leach, *H. maculata*, Leach, *Auchmeromyia luteola*, F., and *Mydaea* sp. Of these, the two Hippoboscids only can be really incriminated. The collection also contained two species of *Gastrophilus*, said by natives, to transmit African horse sickness. One of these is a new species, caught on a native mule, and is described under the name *Gastrophilus magnicornis*. A bibliography of twelve works is appended to this paper.

Galaine (C.) & Houlbert (C.). **Pour chasser les mouches de nos habitations.** [To drive flies out of our houses.]—*C. R. hebdom. Acad. Sci., Paris*, clxiii, no. 5, 31st July 1916, pp. 132–135.

The method of driving flies out of rooms here recommended is based on the reactions of house-flies to blue and green light. When exposed to a blue light, the authors found that the flies first become restless, then inactive, as in the dark. If therefore in rooms in which the light comes from one side, the windows are filled with blue glass and provided at intervals with moveable shutters, flies, being attracted to white light, will not enter from the outside ; those which enter while the windows are open will either become inactive or quickly go out through the shutters. The same principle can be applied to rooms lighted from opposite sides ; in this case only one set of windows is opened at a given time. Articles of food should be placed in cupboards, etc., provided with blue glass windows.

Langeron (M.). **Remarques sur les larves du *Culex geniculatus* et sur les larves de Culicinés pourvues d'un long siphon.** [Remarks on the larvae of *Culex geniculatus* and on Culicine larvae with long siphon tubes.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 7, 12th July 1916, pp. 438–442, 8 figs.

In various parts of France and in Tunisia Culicine larvae with long and narrow respiratory siphons have been found in Anopheline breeding places. Larvae taken in Brittany were bred out and proved to be those of *Culex geniculatus*, Ol., known to occur in France, Italy and Palestine. These larvae have a strong resemblance to those of the North American species, *C. territans*, Walk., which are also found associated with Anophelines in clear, standing water. The larva of *C. salinarius*, Coq., also resembles that of *C. territans*, though its siphon is stouter and it is adapted to brackish water, though it lives preferably in permanent swamps.

Vialatte (C.). **Rapport sur le fonctionnement du laboratoire de microscopie de Beni-Abbès (Sahara-Oranais) en 1915.** [Report on the work of the laboratory of microscopy at Beni-Abbès (Oran Sahara) inl 915.]—*Bull. Soc. Path. Exot., Paris*, ix, no. 7, 12th July 1916, pp. 469–486, 1 plan.

The rainfall in this district is very scanty and the streams are dry except in the rainy season, but pools of brackish water are to be found in those places where the subsoil water reaches the surface owing to differences of level. This water is sometimes as much as 30 feet below the surface, whence it is raised by a very primitive system of buckets on long levers for irrigation purposes. Most of these wells are in daily use and the water is so much disturbed in them that they cannot serve as mosquito breeding places ; others are hardly ever used, and in these mosquitos can and do breed. The stagnant pools produced by the outcrop of the subsoil water are nearly always close to groups of palms and provide good breeding grounds for mosquitos. The winter, spring and summer of 1915 were exceptionally rainless, so that the pools were reduced to a minimum and no Anophelines and very few Culicines were sent to the Station. Heavy rains fell in September and October and great numbers of pools of water, which persisted for several weeks, were formed ; these, so far as they were examined, yielded Culicine larvae only. The area has always been known as malarious and the author points out that the prevailing notion that the oases of the Sahara are free from malaria is entirely erroneous; in this particular oasis, 31 infected subjects were found out of 121 examined, the majority of them being children. At Beni-Abbès itself, the conditions of which are described in detail with a plan, a few female Anophelines were caught in July and November ; the Culicines never completely disappeared, and their larvae were always to be found in fire buckets and other receptacles. The very mixed population, both civil and military, always provided a good reservoir, and of 77 persons examined 45 carried the parasites in their blood. The French population protect their houses with wire gauze, and measures have been taken to convert into a garden a marshy area which bred mosquitos in quantity.

The form of trypanosomiasis in horses known locally as debab was much less prevalent in 1915 than usual, and its prevalence appears to be more or less directly proportional to that of various species of Tabanids, the exceptional dryness of 1915 being very unfavourable to the development of these flies. Camels which traverse the areas infested by them appear to be specially liable to trypanosomiasis. Organisms have been found in a dog indistinguishable from *Trypanosoma berberum*, the active cause of debab, and the animal presented all the usual symptoms of attack. Nearly all the camels of the district suffer from myiasis and when on the march constantly expel large whitish larvae from their nostrils. This is especially the case in March and July, and these larvae are found in the frontal sinuses and naso-pharyngeal cavities of every dromedary slaughtered, 30 or more being quite a common number. Only two insects were bred from a large number of larvae and these were sent to the Institute Pasteur d'Algerie for identification. The harm done by these larvae to the animals appears to be small and the natives believe that those individuals which are free from them are intractable and difficult to manage. At Beni-Ounif in the height of summer there was an outbreak of a species of *Phlebotomus* ; these midges were rare at Beni-Abbès.

Vida y costumes do berne. [The life and habits of *Dermatobia hominis.*] —*Chacaras & Quintaes*, *S. Paulo*, xiii, no. 6, 15th June 1916, pp. 422–423, 4 figs.

This is a popular article on *Dermatobia hominis* and refers to the mosquito, *Janthinosoma lutzi*, which is suspected of distributing the eggs of this fly.

Mayr (L.). **Die Bekämpfung der Pferdelaus mit Ikaphthisol.** [Control of the horse louse with Ikaphthisol.]—*Berliner Tierärztl. Wochenschr., Berlin*, xxxii, no. 24, 15th June 1916, pp. 279–281.

Ikaphthisol is said to be the best insecticide available against the lice on horses. It is a white powder, which smells like cresol, but not so strongly. Besides oxytoluol or cresyl alcohol, the other ingredients are carbonate of magnesia, bolus alba, talc, crude cresol and sapo medicatus. The powder only requires dusting on, the quantity per horse being from 5 to 7 oz. and costing about 3d. The lice are killed in a few minutes, hundreds being combed out 5–10 minutes after application. In the case of very badly infested animals a second application is advisable.

Schmidt (M.). **Durch die Kolumbácser Mücken hervorgerufene Erkrankungen.** [Sickness among live-stock caused by "Kolumbácser gnats."]—*Deutsche Tierärztl. Wochenschr., Hannover*, xxiv, no. 27, 1st July 1916, pp. 247–248.

At the end of April and during May swarms of gnats [*Simulium*] appeared in some localities in south Hungary during a spell of calm weather following prolonged winds. In the district under the author's veterinary supervision 67 cattle, 1 donkey, 6 horses, 71 pigs and 10 sheep died and 24 cattle had to be slaughtered. When attacked by the flies, the animals, especially cattle, take to flight unless they are able to take refuge in neighbouring water or in the smoke of fires. The flies settle on the hairless parts in order to suck blood and their bites are shortly followed by symptoms such as laboured breathing, a stumbling gait and rapid pulse, and painful swellings in the loose-skinned portions (as beneath the neck). Animals attacked by large numbers die in from one to two hours without signs of oedema. Less severe cases are characterised by loss of appetite, abortion, marked depression and blindness. The swellings go down in four or five days after rubbing with spirits of camphor, but the blindness may be permanent. The animals which died or were slaughtered showed serous infiltration of the subcutaneous tissue with ecchymosis. Treatment consists in wiping off the flies with a rag, the internal administration of diluted alcohol and repeated rubbing with spirits of camphor.

Rène (C.). **Pour protéger les animaux contre les atteintes des mouches.** [The protection of animals against flies.]—*Progrès Agricole, Amiens*, xxx, no. 1486, 9th July 1916, pp. 366–367.

This article deals in popular form with the measures required to protect domestic animals against various flies. Stalls and stables must be cleaned at frequent intervals, their walls should be light coloured and openings should be screened with wire gauze. The following solutions are said to be effective repellents. Five per cent. cresyl, one per cent. picric acid, ten per cent. boric acid, and ten per cent. saponin. These washes should be applied once daily.

Colony of the Gambia: Quarantine Ordinance, 1916.

Part of section 34, which deals with restriction on embarcation at an infected place in the Colony, states that measures shall be taken to prevent rats in the case of plague, and *Stegomyia* in the case of yellow fever from gaining access to ships. In the case of yellow fever the ship shall lie at least one thousand yards from the inhabited shore. When access of *Stegomyia* or rats to the ship cannot be prevented, measures shall be taken immediately before departure of the vessel to secure destruction of the mosquitos or rats on board.

HIRST (S.). **On the Occurrence of a Tropical Fowl Mite (*Liponyssus bursa*, Berlese) in Australia, and a new Instance of its attacking Man.**—*Ann. Mag. Nat. Hist., London,* xviii, no. 104, August 1916, pp. 243–244.

The Gamasid mite recently described by the author under the name *Leiognathus morsitans*, sp. n., is now regarded as identical with *Liponyssus bursa*, Berlese. Specimens of *L. bursa* were recently obtained from a sitting-hen at Sydney, Australia, and were also found attacking man in the same town. The collector suggested that in the latter case, the mites might have come from English starlings which were building in the house. *Dermanyssus gallinae* does not flourish in tropical and subtropical countries, and it is probable that when this species is recorded from such regions, *L. bursa* is really concerned. The wide distribution of *L. bursa* may be the result of carriage by the common sparrow.

TOWNSEND (C. H. T.). **On Australian Muscoidea, with Descriptions of New Forms.**—*Insecutor Inscitiae Menstruus, Washington, D.C.,* iv, nos. 4–6, April–June 1916, pp. 44–45. [Received 9th August 1916.]

The new genera *Pseudorthellia* for *Lucilia viridiceps*, Macq., and *Austrophasia* for *Hyalomyia rufiventris*, Macq., are erected. *Ornithomusca victoria*, gen. et sp. n., obtained from the nest of *Pardalotus* sp. in Victoria is described. *Eumusca australis*, Mcq., figured by Froggatt as *Musca autumnalis* (*corvina*) is recorded from New South Wales.

DYAR (H. C.). **Mosquitoes at San Diego, California.**—*Insecutor Inscitiae Menstruus, Washington, D.C.,* iv, nos. 4–6, April-June 1916, pp. 46–51. [Received 9th August 1916.]

Investigations carried out in the spring of 1916 in San Diego, California, showed that the yellow fever mosquito, *Stegomyia fasciata* (*Aëdes calopus*) was not present. The following species were found :—*Culex tarsalis*, Coq., breeding in fresh and salt-marsh pools ; *C. stigmatosoma*, Dyar, found in fresh water without vegetation ; *C. comitatus*, D. & K., found only in artificial receptacles ; *C. erythrothorax*, Dyar, confined to permanent ponds ; *C. territans*, Walk., occurring abundantly in pools in the San Diego River Valley ; *C.* sp. near *derivator*, D. & K. ; *C. anips*, sp. n., found together with *C. erythrothorax* ; *Culiseta incidens*, Thompson, in drainage pools ; *Aëdes squamiger*, Coq., and *A. taeniorhynchus*, Wied., breeding in salt marshes ; *Uranotaenia anhydor*, Dyar, occurring in the same pools as *C. erythrocephala*; *Anopheles pseudopunctipennis*, Dyar, and *A. occidentalis*, D. & K., favouring permanent reedy pools. *A. punctipennis*, Say, has been previously recorded in this district, but was not found in the collection under consideration.

Dyar (H. G.) & Knab (F.). **Eggs and Ovipositon in Certain Species of *Mansonia* (Diptera; Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, iv, nos. 4–6, April–June 1916, pp. 61–68, 2 figs. [Received 9th August 1916.]

The egg-masses of *Taeniorhynchus* (*Mansonia*) *perturbans*, *T. fasciolatus* and *T. arribalzagae* differ slightly in shape, but agree in the fact that they float on the surface of the water, with one side usually resting against an aquatic plant. The eggs of *T. titillans* and *T. humeralis*, sp. n., are peculiar in that they have been found attached to the undersurface of the leaves of *Pistia*, being generally placed in masses between the veins. The method of oviposition of *T. titillans* is described. In the case of females kept under observation, egg-laying was found to follow a blood meal after an interval of four or five days.

Cousins (H. H.). **General Observations.**—*Ann. Rept. Jamaica Dept. Agric. for the Year ended 31st March 1916, Kingston*, 1916, pp. 1–4. [Received 14th August 1916.]

Cases of tick-fever were few and slight. The dipping tank had been in regular use since June 1915 with very satisfactory results. The dipping fluid consisted of 2 lb. of arsenite of soda (80 per cent.) and 3 lb. paranaph per 100 gals. The consumption of material for nine months consisted of 73 lb. of arsenite of soda and 110 lb. of paranaph, costing 52*s.* for that period, equal to £3 10*s.* 0*d.* per annum for a herd averaging 180 head, or 4¾*d.* per head per annum. From continued use, a reducing action on the arsenic is maintained which greatly economises the consumption of arsenite of soda. All the cattle, both imported and native, young and old, were dipped regularly. It was however found undesirable to dip cows about to calve. In two cases cows suffered somewhat from arsenical poisoning, though no deaths resulted from the dipping. The work of dipping becomes more rapid as the cattle get accustomed to the tank.

Griffitts (T. H. D.). **A mosquito collecting device.**—*Jl. Amer. Med. Assoc., Chicago*, lxvii, no. 2, 8th July 1916, p. 117, 1 fig.

This mosquito collecting apparatus is an application of the principles of the fly trap. In the size recommended it consists of a glass or celluloid tube about 1 inch in diameter and 5 inches long, open at both ends; one end, when in use, is closed by a cork or other stopper. The other end, which contains the trap, consists of a cork stopper to fit the tube, three-eighths of an inch thick, having a central opening half an inch in diameter to accommodate the trap tube. A small glass or celluloid tube about three-fourths of an inch long, of the shape of a truncated cone to fit tightly in the opening in the cork, is required. The outer end should be half an inch in diameter and the inner end three-eighths of an inch. The entrance of the mosquitos may be observed through the glass or celluloid. In making a catch the trap end of the tube is placed over the resting mosquito. On an average each capture took three seconds.

Bacot (A. W.). **Report of the Entomological Investigation undertaken for the Commission for the Year, August 1914 to July 1915.**—*Rept. Yellow. Fev. Commiss.* (*West Africa*), *London*, iii, 1916, pp. 1–191, 27 figs., 29 plates, 9 charts. [Received 14th August 1916.]

This report falls into two sections, the first containing notes on the distribution of mosquitos in Freetown and the second dealing with the bionomics of *Stegomyia fasciata.*

Adult mosquitos are comparatively rare in Freetown, the most important species present being *Culiciomyia nebulosa* and *S. fasciata.* The larvae of the former occur in almost any damp or shaded position, while those of the latter are well hidden in protected places. Hence the necessity arises for continuous and careful search on the part of the Sanitary Department. In the outlying areas of the town and in the neighbouring villages much still remains to be done with regard to drainage of surface water and the removal of breeding places. *Anopheles* (*Pyretophorus*) *costalis* and *A.* (*Myzomyia*) *funestus* are more restricted in distribution and breeding places, the former being found in rock and gutter pools, the latter in isolated rock pools at the foot of the hills east and west of Freetown. *Uranotaenia ornatus* and *Eretmopodites dracaenae* are restricted to collections of water in the axils and central whorl of leaves of certain plants. *S. simpsoni*, mainly occurring in root holes, is sometimes found in similar situations, together with *S. fasciata* and *C. nebulosa.* The use as a hedge plant of species of *Dracaena* in which water collects should therefore be discouraged.

The eggs of *S. fasciata* are always deposited on a film of water, never on a dry surface. They are generally found at the margin of a pool, etc., or on a partially submerged object. Those at the margin become submerged during rainy periods. In a few cases eggs laid on the surface of the water have been observed. Hatching can take place when the egg is floating, attached to the margin just below the surface, or resting on the bottom. Preliminary experiments showed that hatching was dependent to a certain degree on external conditions, among which desiccation, temperature and change of water acted as stimuli on a certain proportion of the eggs. Submergence in a small quantity of water appeared to increase the mortality among the eggs. During the course of the same experiments, it was noted that the period between the time of immersion of the egg and the time of hatching, in cases in which no dry period intervened, could be prolonged for four or five months. A higher mortality was observed among eggs which had been stored than among those which were immersed immediately or soon after laying. The material on which eggs are deposited appears to determine whether they will survive or not during periods of drought. The effect of high and low temperatures on the rate of hatching was observed. Cooling to temperatures between 74° and 80° F. acted as a stimulus to hatching in most cases, but a few eggs remained resistant. Cooling is probably the factor which causes hatching when dried eggs are immersed or when fresh water is added to developing eggs. A rise in temperature from 80° to 95° F. had little effect on hatching. Eggs stored for 50 hours under moist conditions hatched in the majority of cases within 30 minutes after subsequent immersion; those dried for one to seven days after incubation hatched, when immersed, to the extent of 84 and 54 per cent. respectively in from one to four days. Dry and humid conditions are therefore direct factors in inducing the immediate or deferred hatching of eggs. Eggs stored under dry conditions yielded larvae after 262 days, when immersed in water. Incubated eggs were exposed to varying temperatures to determine the effect on hatching. Exposure was continued for 24 hours and the eggs were then placed in water at 75° F. and examined after 128 hours. Exposure to 29° F. gave 81 per cent. hatching ; to 75° F., 80 per cent. ; to 95° F., 28 per cent. ; and to 102° F., 12 per cent. No hatching occurred after exposure to a temperature of 107·6° F. for 24 hours. Heating to 114·8° F. for 30 minutes destroyed the vitality of eggs which had been laid for 15 or 16 hours ; similar eggs heated to 97° F. hatched normally. The only enemy definitely known to attack the eggs of *S. fasciata* under storage conditions was a species of Psocid.

Larvae developed readily in water containing a plentiful supply of organic matter, such as dead leaves, boiled white of egg, rice, dead insects, etc. The first moult was not passed through in tap water, until organic matter was added. Scarcity of food produced a high mortality and, among living individuals, increased the duration of this stage in some cases to 70 days. Under favourable conditions larval development was completed in four days, and adult males appeared on the fifth day. Bacteria were probably assimilated by the larvae and may possibly have been essential to development. Both larvae and pupae were unable to withstand complete submergence for 20 hours. Activity was maintained during exposure to the heat of the sun, when the temperature of the water varied from 75° F. to 103° F. Water heated to 115° F., however, proved fatal to both larvae and pupae. Exposure to a temperature of about 40° F. for two or three hours caused larvae and pupae to become dormant, the former being found on the bottom of the containing vessel, the latter remaining on the surface. Pupae resumed their activity at 60° F., and larvae at 80° F. No cannibalism was observed among the larvae, although the decaying bodies of those which died in the breeding jars served as food for the survivors.

Pairing and feeding on the part of adult females was found to occur as soon after emergence as possible. Dry weather acted as a deterrent to feeding both in and out of doors ; drought probably caused an absence of odour and a consequent failure to recognise the presence of a host. Fertile eggs were deposited after the first blood meal, but only when water or moist surfaces were available. Vigorous females fed within 24 hours after egg-laying and again on the following day. Goats, dogs, bandicoots and rats proved suitable hosts. In two cases single eggs were laid by females which had been fed on a mixture of blood and honey, and blood and syrup, respectively. The duration of the adult stage without food averaged from six to eight days, with an extreme of 12 days. Moist conditions were more favourable for prolonging this stage than dryness or blood meals. When water was not available for oviposition, the average duration of the adult female stage was prolonged to 31·3 days, with an extreme of 74 days. Experiments to induce oviposition in the absence of a blood meal met with negative results. In one case, a female which had survived on honey and white of egg for 56 days without egg-laying was given three blood meals ; fertile eggs were deposited four days after the first blood meal.

The maximum period during which the spermatozoa remained active in the spermothecae of the female was 62 days; the female in question laid further batches of eggs after this period, but none were fertile. One male fertilised 10 out of 21 females, but these as a whole produced few eggs. This may have been due to the fact that insufficient food had been supplied in the larval stage. Dry climatic conditions proved most fatal to the adults. Natural enemies included the ants, *Monomorium pharaonis*, L., and *Solenopsis geminata*, F., the spider, *Uloborus feniculatus*, the scorpion, *Isometrus maculatus*, small Mantids, two species of wall-haunting lizards and a gecko.

Larvae and pupae of *S. fasciata* reared in captivity were heavily parasitised by the gregarine, *Lancasteria culicis*, Wenyon. Bacteria occurred in the larval gut and adult stomach, and in the latter yeasts were also present.

Observations were made on the bionomics of certain forms allied to *S. fasciata*. Larvae of *S. sugens* were obtained from small rock pools. Eggs laid by adults arising from these larvae incubated in captivity in two days. The eggs and larvae of this generation were affected by heat, cold, and drought in a similar manner to those of *S. fasciata*. Storage of the eggs under moist conditions was apparently less favourable than in the case of *S. fasciata*. Larvae became full-grown in three days, pupated within four or five days, and adults emerged on the sixth day. Under natural conditions the developmental period was probably shorter. No wild adults were captured; those obtained in the breeding cages paired at night or in a darkened cage, and among the females, feeding was in no way connected with pairing. The number of eggs laid was limited to two batches, but in nature probably more are deposited. The duration of life of the adult female extended in some instances over a month. Eggs of *S. simpsoni* were resistant to drought, as in the preceding species. Captive females fed readily at night on human blood; pairing was not observed and only infertile eggs were laid. The duration of the female life exceeded a month. Observations on *S. luteocephala* were very similar to those recorded for *S. simpsoni*. Larvae and adults of *Ochlerotatus apicoannulatus*, *O. minutus* and *Uranotaenia ornatus* were obtained. *Eretmopodites quinquevittatus* and *E. chrysogaster* were collected from water in tins, etc., and *E. dracaenae* from leaf whorls and leaf axils. Pairing and feeding on human blood took place and eggs were deposited by *E. quinquevittatus*. They were laid beneath the surface of the water and were probably not resistant to drought, since all hatched within a few days and those removed from the water collapsed on drying. The eggs were of two kinds, large and small; the former hatched in two or three days, the latter in five or six days. Adults fed readily on human blood, but man is probably not the normal host. Those supplied with honey, water and banana lived for two or three weeks.

The breeding and dispersal of mosquitos in Freetown is dependent on climatic conditions, and especially on the character of the onset of the rainy season and the tornado at the beginning of March. Mosquitos are usually carried down the estuary of the Sierra Leone River to the town and beyond it to the shipping in the harbour. It is therefore important that drainage measures should be extended to the outlying districts of the town and that operations against breeding places should be begun at the commencement of the rains.

The value of petroleum, soft soap, flake naphthaline and sea water in destroying eggs, larvae and pupae of *S. fasciata* was tested. Petroleum (1 in 600) killed the majority of larvae and pupae in one hour, but had no effect on the eggs, nor were the larvae hatching from the eggs affected. Soft soap (1 in 600) killed larvae, pupae, and young larvae hatching from the eggs. The eggs themselves developed normally when submerged for 20 hours, but were affected by submergence for eight days. At the rate of 1 in 8,000 soft soap was almost useless, while petroleum (1 in 4,000) was an efficient larvicide when allowed to act for 48 hours. Naphthaline (1 in 8,000) was fatal to larvae; it was not effective against pupae, but killed all adults emerging during the first day of exposure and 50 per cent. of those emerging during the second. At the rate of 1 in 4,000, larvae, pupae and adults emerging from pupae were destroyed when the receptacle was protected by a cheese cloth cover. In an emulsified form the above substances were more effective and cheaper than when used singly. All larvae and pupae were killed by an emulsion of petroleum and soft soap at the rate of 1 in 16,000, or by petroleum, soft soap, and naphthaline at the rate of 1 in 20,000. Larvae within the eggs were not affected by the former emulsion at a strength of 1 in 8,000, but the same liquid induced the less resistant eggs to hatch at once and consequently the emerging larvae were killed. Sea water had the effect of hastening the hatching of eggs, but none of the larvae which emerged lived for more than one hour. Pupae were able to complete their development after 16 hours exposure to salt water. Resistant eggs hatched to the extent of 36 per cent. after 20 hours' immersion in sea water, while among similar eggs in tap water only 2 per cent. hatched in the same period. Of those remaining in the salt water, a further 43 per cent. hatched on removal to tap water after 44 hours' immersion. It is suggested that in coast towns salt water might be used for flushing gutters, sewers, etc., after clearing; it should be applied freely at the close of the rains.

This paper concludes with a description of the methods and apparatus used for carrying out the above experiments.

VELU (—). **Note sur une lesion de myase intestinale chez le cheval.** [Note on a lesion resulting from intestinal myiasis in the horse.]—*Recueil Méd. Vet. Alfort*, xcii, no. 13, 15th July 1916, pp 408–410, 2 figs.

The long drought of 1913 in Morocco greatly favoured the attack of parasites in many domestic animals. The number of Oestrids greatly increased and in nearly every horse examined post-mortem over a 1,000 larvae were usually found. Ordinarily, even when present in large numbers, these larvae produced no apparent ill effect on their host; the inflammation produced is usually very limited and this causes a thickening of the bottom of the cavity in which the larva is buried, which tends to prevent perforation and the consequent peritoneal injury that may end in death. Three species, *Gastrophilus equi*, *G. nasalis* (*veterinus*) and *G. haemorrhoidalis*, were present, but the lesions which resulted in death were caused entirely by *G. nasalis*.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 89, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.
Notes on Dengue in New South Wales 149
Report on Yellow Fever in Lagos 149
Stegomyia and Yellow Fever in Ecuador 149
Mosquitos and other Blood-sucking Insects in Sierra Leone .. 149
Blood-sucking Organisms and Disease in Sierra Leone 150
The Nature of the Virus of Yellow Fever 150
Insect-borne Diseases in Rhodesia 151
Insects and Disease in the Gold Coast 151
Notes on Fleas from Caucasia and Persia 151
Anophelines of Minnesota not carrying Malaria 152
The Development of Malaria Parasites in American Anophelines .. 152
Heavy Oils as Mosquito Larvicides 152
Exanthematous Typhus and Lice in Tunis 153
The Conveyance of Typhus Fever by Lice 153
The Control of Lice 153
The Control of Malaria in South Africa 154
Malaria Prevention on Active Service in Africa 154
Dermacentor venustus and Rocky Mountain Spotted Fever in the U.S.A. 154
The Effect of Tick Bites on Man in the U.S.A. 154
Rat Poison as a means of exterminating Plague in Japan 154
Cyanide Gas for the Destruction of Insects 155
A new Oestrid from Eritrea 156
The Deterrent Effect of Blue Light on House-Flies 156
Notes on the Larvae of *Culex geniculatus* in France 156
Malaria and other Insect-borne Diseases in the Sahara 156
The Habits of *Dermatobia hominis* in Brazil 157
The Control of Lice on Horses in Germany 158
Damage to Live-stock by *Simulium* in Hungary 158
The Protection of Domestic Animals against Flies 158
Quarantine Measures against Plague and Yellow Fever in the Gambia 159
Liponyssus bursa attacking Man in Australia 159
New Australian Muscid Flies 159
Mosquitos at San Diego, California 159
The Bionomics of Mosquitos in the U.S.A. 160
Dipping against Ticks in Jamaica 160
A Trap for collecting Mosquitos 160
The Bionomics of *Stegomyia fasciata* and other Mosquitos in Sierra Leone 161
Gastrophilus spp. infesting Horses in Morocco 164

Insec

VOL. IV. Ser. B. Part 11.—pp. 165-180. NOVEMBER, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

Smit
JAN
Nationa

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., ***Chairman.***

Lieutenant-Colonel A. W. ALCOCK, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. AUSTEN, Entomological Department, British Museum (Natural History).
Dr. A. G. BAGSHAWE, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. BLECH, C.M.G., Foreign Office.
Sir J. ROSE BRADFORD, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir DAVID BRUCE, C.B., F.R.S., A.M.S.
Mr. J. C. F. FRYER, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. HARMER, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. MAXWELL LEFROY, Imperial College of Science and Technology.
The Hon. Sir JOHN McCALL, M.D., Agent-General for Tasmania.
Dr. R. STEWART MACDOUGALL, Lecturer on Agricultural Entomology, Edinburgh University.
Sir JOHN McFADYEAN, Principal, Royal Veterinary College, Camden Town.
Sir PATRICK MANSON, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir DANIEL MORRIS, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. NEWSTEAD, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. NUTTALL, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. POULTON, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir DAVID PRAIN, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. READ, C.B., C.M.G., Colonial Office.
The Honourable N. C. ROTHSCHILD.
Mr. HUGH SCOTT, Curator in Zoology, Museum of Zoology, Cambridge.
Dr. A. E. SHIPLEY, F.R.S., Master of Christ's College, Cambridge.
Sir STEWART STOCKMAN, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. THEOBALD, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. WARBURTON, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. PARKINSON (Colonial Office).

Director and Editor.

Dr. GUY A. K. MARSHALL.

Assistant Director.	Assistant Editor.
Mr. S. A. NEAVE.	Mr. W. NORTH.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.
Publication Office.—89, Queen's Gate, London, S.W.

Correspondence Relating to the Possibility of the Introduction of Yellow Fever by Land into the Gold Coast.—*Rept. Yellow Fev. Commiss. (West Africa), London,* iii, 1916, pp. 196–214, 2 maps. [Received 14th August 1916.]

This correspondence includes a letter from the Chief Commissioner of the Northern Territories in which it is stated that *Stegomyia fasciata* and *Anopheles costalis* occur throughout the Protectorate and tsetse flies are found everywhere in the vicinity of the large rivers. The large number of roads entering the Northern Territories from surrounding districts increases the chances of infection and the spread of disease, but at the same time avoids congestion in the movements of cattle.

Correspondence Relating to the Introduction of Infection into the West African Colonies by Sea.—*Rept. Yellow Fev. Commiss. (West Africa), London,* iii, 1916, pp. 215–241. [Received 14th August 1916.]

Records are given of the degree of prevalence of mosquito larvae and adults found on vessels trading with ports of the West African Colonies. Adults of the following species were found :—*Culex decens, C. duttoni. C. pipiens, Anopheles* (*Pyretophorus*) *costalis, Ochlerotatus* sp., *Stegomyia fasciata* (*calopus*). Larvae of the following were found in collections of rain water occurring in native canoes or boats plying between the harbour and the shore :—*S. fasciata, S. sugens, C. duttoni, C. pipiens.* No mosquitos were found in the holds of any of the vessels examined. The places most infested by mosquitos were Forcados, Opobo, Benin. Brass, Okrika and Port Harcourt.

Descazeaux (J.). **Traitement de la gale.** [Treatment of Mange.]—*Recueil Méd. Vet., Alfort,* xcii, no. 14, 30th July 1916, pp. 227–237, 1 fig.

The usual treatment of French army horses at the front when suffering from mange has been to smear their coats with some parasiticide in a basis of grease or vaseline and to leave them unwashed for a week or more. The result is that all the dust and dirt to which they are exposed sticks to the hair, the coat becomes excessively filthy and the condition of the animals is rendered worse rather than improved. As the loss of service from sarcoptic mange among the horses of the French army has been very serious, in some units as much as 60 per cent., the author, who has a high opinion of the value of dipping as practised in South America, has urged and, despite great opposition, has succeeded in obtaining the construction of a proper dipping tank, a scale drawing and detailed description of which is given. The bath was warmed by a steam jet passing directly into the dip, which is necessarily diluted by the condensed steam by about 28 gallons per diem. As the composition of "Sarnol," a commercial article much used in South America was not known, the following mixture was tried with success, containing in parts per 1,000 of water, cresyl 25, arsenious acid 1, potassium polysulphide 6, sodium carbonate 10. The simplest method of preparation was to place the ingredients in proper proportions in sacks and suspend these for a whole night in the total quantity of liquid required ; by keeping a quantity of the mixture always ready for solution there was no practical difficulty in keeping the bath up to strength. The procedure is as follows: all shoes are removed from the horses to be treated and each is clipped and thoroughly rubbed over with soft soap, they are then taken in batches of 150 at a time to the dipping tank. The manner of handling them is described and it is said that there is rarely any trouble, especially after the second dipping. Nine times out of ten the horse immerses itself completely, and if not, a man is at hand with a pail to complete the dipping, during which the horses have to swim 20–25 feet. As the horses emerge they are taken to a room where a dozen men with hand-brushes scrub them thoroughly from head to foot; they are then covered, if the weather be cold, and taken at once to stable; in winter a short stay in an artificially heated drying room would be very desirable, if such a room could be provided. A staff of 16 men can handle 150 animals in a little over two hours. The operation must be repeated every four or five days, and an average of eight dippings is required to cure a mangy horse; during treatment each horse is thoroughly brushed and rubbed all over once daily. The results are claimed to have been very satisfactory; itching ceased after the first or second dipping; the sores healed rapidly and the skin quickly became clean and healthy; every part of the body shared in these benefits, and in a fortnight the hair began to grow again on the bald places and the coat generally became glossy and abundant. The recovery of bodily condition was also very marked, possibly owing to the arsenic absorbed acting as a tonic. Although the bath has only been in operation a few months, the advantages of immersion over any treatment by ointments have become obvious; losses by death or rejection have been reduced by 50 per cent. in the area in which the dip is used, and the cost of the eight dips required to cure a horse amounts to a little over one shilling. It is suggested that where a dipping tank cannot be established, all mangy horses should be sprayed very thoroughly, and it is pointed out that a tank to catch the liquid, a few square feet of cement floor for the horse to stand on, and a good spray pump is all that is required beyond the necessary chemicals, and that prompt treatment on the spot by this method would keep a large number of horses in working condition, which would otherwise be useless for a long time or rejected altogether from the service.

WATERSTON (J.). **Fleas as a Menace to Man and Domestic Animals, their Life-History, Habits and Control.**—*Brit. Mus.* (*Nat. Hist.*), *Economic Ser. no. 3*, *London*, 1916, 21 pp., 6 figs. [Received 24th August 1916.]

This pamphlet gives an account of the structure, life-history and habits of fleas and describes methods for their control. The species mentioned as occurring in Britain are *Pulex irritans*, *Ctenocephalus canis*, *C. felis*, *Ceratophyllus fasciatus*, *C. gallinae*, *Spilopsyllus cuniculi* and *Leptopsylla musculi*.

The Poultry Lice Crop Good.—*Weekly Press. Bull.*, *Penns. Dept. Agric.*, *Harrisburg*, i, no. 31, 10th August 1916.

The commonest species of lice on chickens and pigeons in Pennsylvania are *Menopon biseriatum* and *M. pallidum.* Dusting with pyrethrum or Persian powder is recommended as a control measure. Mites, which are more abundant than the lice, can be destroyed by cleaning the poultry houses thoroughly with boiling water, creosote or a coal tar solution. Fumigation with sulphur or formaldehyde is also recommended.

Ross (P. H.). **Dermatitis due to the secretion of a beetle in British East Africa.**—*Jl. Trop. Med. & Hyg., London,* xix, no. 17, 1st September 1916, p. 202.

In July and August 1915 many cases of acute dermatitis due to contact with a small beetle occurred at Nairobi, and the fact is recorded as a similar epidemic occurred in West Africa, at Leopoldville [see this *Review,* Ser. B, iv, p. 15]. These specimens were identified by the Imperial Bureau of Entomology as *Paederus crebripunctatus,* Epp.

Saunders (Winifred H.). **Fly Investigations Reports.—i. Some Observations on the Life-History of the Blow-Fly and of the House-Fly, made from August to September 1915, for the Zoological Society of London.**—*Proc. Zool. Soc., London, London,* 1916, Part iii, September 1916 pp. 461–463.

In experiments made on *Calliphora erythrocephala* and *Lucilia caesar,* the flies were allowed to oviposit on raw meat. Eggs of the former species laid on 1st–2nd September hatched on 2nd–3rd; the larvae pupated after from 10 to 16 days, and adults emerged in from 8 to 13 days later. *L. caesar* differed from *C. erythrocephala* in that in some cases the pupal stage was prolonged to 24 days. Some eggs and larvae were killed by a temperature of 100·4° F. Later in the year the larval period extended over several weeks, and all larvae died at the beginning of November. Oviposition did not take place on dry meat.

Eggs of *Musca domestica* were laid on banana, either under the loose skin or in crevices of the pulp. Hatching took place on the day following oviposition, although half the eggs were kept at a temperature of 100·4° F. and the remainder at from 40° to 60° F. The food of the larvae consisted of banana and a mixture of bread, casein, sugar and water. The same mixture was also found suitable for *C. erythrocephala* and *L. caesar.* The duration of the life-cycle up to the time of emergence of the adult varied from 9 to 14 days at 100·4° F., and from 23 to 25 days at from 40° to 60° F.

Saunders (Winifred H.). **Fly Investigations Reports.—ii. Trials for Catching, Repelling, and Exterminating Flies in Houses, made during the year 1915 for the Zoological Society of London.**—*Proc. Zool. Soc., London, London,* 1916, Part iii, September 1916, pp. 465–468, 3 tables.

The investigations recorded in this paper were carried out at a house in Kent during August and September 1915. A breeding place for flies was furnished by a manure heap near the house. Measures were taken (1) to prevent breeding by treating farmyard manure (*a*) in the manure heap with tetrachlorethane, 1 part in 20 of water, every four days; (*b*) in the garden with green oil and soil at the rate of 1 part of oil and 40 of soil to 100 square feet of surface; (2) to destroy flies by poisoning and using traps. The treatment of manure did not perceptibly decrease the number of flies; they must therefore have migrated from a breeding place further distant. The traps used were fly-papers and balloon traps baited with casein and sugar in equal parts, moistened with stout, banana, or water. Fly-papers captured much larger numbers than the balloon traps during the same period. Of the latter, those in which banana formed part of the bait gave the best results. Rooms were sprayed with Fly-bane, Exol and Army Spray. Fly-bane killed flies by contact, but did not act as a repellent; its use in rooms was accompanied by certain disadvantages. Exol paralysed flies in half an hour, but all recovered within 20 hours. Army Spray killed flies by contact, but was not a deterrent. Treacle, arsenic and water used as a spray and placed on rags proved useless.

SAUNDERS (Winifred H.). **Fly Investigation Reports.—iii. Investigations into Stable Manure to check the Breeding of House-Flies, made during the year 1915 for the Zoological Society of London.**—*Proc. Zool. Soc., London, London*, 1916, Part iii, September 1916, pp. 469–479.

A number of compounds were tested as to their value in destroying fly larvae in manure and acting as repellents against adults visiting manure heaps for purposes of oviposition. The following liquids miscible in water were used as poisons:—Miscible tetrachlorethane; miscible fusel oil, 1 per cent.; miscible pyridine, 5 and 10 per cent.; soluble tar oil; higher pyridine bases; neutral blast-furnace oil; heavy and light miscible oil. Non-miscible liquids tested as repellents were:—Neutral blast-furnace oil; blast-furnace creosote; green oil; tar oil and pyridene; mineral oil and pyridene. All substances used in the manurial experiments were tested on plants to determine the effect on germination, growth, etc.

The results showed that the following methods of treatment were very successful:—(1) the surface-dressing of manure with green tar oil or with neutral blast-furnace oil and soil, at the rate of 1 part oil to 40 parts soil; the mixture was spread over the surface of the heap to a depth of one inch, and in forming a new heap, the ground below was previously oiled; (2) the application of tetrachlorethane, in the miscible or pure form, at the rate of 2 oz. to 10 cubic feet of manure. Both substances killed fly larvae and were harmless to plants. The effect of the tar oil was permanent, as it was resistant to rain, while that of tetrachlorethane lasted only while the liquid vaporised. The use of tar oil is recommended for large accumulations of manure in camps or for horticultural purposes; the cost is 1s. per gallon when purchased in large quantities.

LODGE (Olive C.). **Fly Investigation Reports.—vi. Some Enquiry into the Question of Baits and Poisons for Flies, being a Report on the Experimental Work carried out during 1915 for the Zoological Society of London.**—*Proc. Zool. Soc., London, London*, 1916, Part iii, September 1916, pp. 481–518, 5 tables.

A number of animal and vegetable substances and chemical compounds were tested as to their relative powers of attracting the following species of blowflies :—*Calliphora erythrocephala*, *C. vomitoria*, *Lucilia caesar*, *Protocalliphora groenlandica*, *Fannia canicularis*, *F. scalaris*, *Piophila casei*, *Sarcophaga carnaria* and *Musca domestica*. The most attractive baits were liver, brain, fish or hard-boiled egg in which maggots were present. Attractiveness increased after the baits had been blown and were in a more or less liquid condition in consequence of the digestive action of the larvae. Animal substances always proved more attractive than vegetable or chemical compounds, but mixtures of casein and peptone with water and bread gave fairly good results when no other bait was present. The offensive smell of decomposing meat substances and of casein and peptone mixtures renders their general use impossible, but they might be placed at some distance from dwelling places, where the odour would not be noticeable. The baits should be placed in sunny positions, since the number of flies then attracted is much greater than in the shade.

Among the baits tested for house-flies, the following were the most satisfactory :—(1) mixtures of casein, sugar and water, with or without banana, in equal proportions ; if beer or stout was added, the mixtures became attractive immediately, otherwise they must be kept one or two days ; (2) malted milk and water ; (3) banana, especially when over-ripe ; (4) custard pudding ; (5) cornflour, milk and sugar ; (6) custard powder, milk and sugar. Casein mixtures had certain advantages on account of their cheapness, the length of time of attractiveness (from 7 to 10 days) and the absence of offensive smell when mixed with sugar, banana, etc. The number of flies caught on dull days was less than on sunny days. Certain substances were tested as to their poisonous effect, mainly on house-flies. The most effective was formalin bait, consisting of 25 cc. of 30 per cent. formalin and 75 cc. casein mixture, which killed 31 per cent. of flies present on the first day. On the second day, ammonium nitrate (5 per cent. pure) killed 53 per cent. of flies ; 40 per cent. formalin, 45 per cent. ; and antimony oxychloride, 37·5 per cent. Experiments on starving flies showed that they could survive longer without food than could those which had been given poisoned baits ; in September and October they succumbed after starving for six days, but in November and December they remained alive for from 7 to 10 days.

A species of *Empusa* caused great mortality during September and October, although breeding continued. The proportion of male and female house-flies emerging during the period covered by these experiments was almost equal, while approximately equal numbers died naturally in August and September. More than twice as many females as males were caught in baited traps, owing to the fact that they visited the traps both for feeding and for oviposition.

SWENK (M. H.). **Descriptions and Records of North American Hippoboscidae.**—*Jl. New York Entom. Soc.*, *Lancaster*, *Pa.*, xxiv., no. 2, June 1916, pp. 126–136. [Received 1st September 1916.]

The following species are recorded from various birds :—*Olfersia albipennis*, Say ; *O. botaurinorum*, sp. n. ; *O. scutellaris*, sp. n. ; *O. intertropica*, Walk. ; *O. angustifrons*, Wulp ; *O. americana*, Leach ; *O. wolcotti*, sp. n. ; *Ornithomyia buteonis*, sp. n. ; *O. costaricensis*, sp. n. ; *O. pirangae*, sp. n.

Felt (E. P.). **Thirty-first Report of the State Entomologist on Injurious and Other Insects of the State of New York, 1915.**—*New York State Mus. Bull., Albany,* no. 186, 1st June 1916, pp. 15–88, 13 plates, 22 tables. [Received 1st September 1916.]

Mosquito investigations were carried out in the neighbourhood of Sodus Bay, where a large swampy area in the immediate vicinity of the village provided a breeding place for large numbers of mosquitos. *Anopheles punctipennis,* Say, occurred in small numbers in June, July and August, the larvae being found most frequently in grassy pools. *Psorophora ciliata,* F., was taken in July and August; the larvae of this species were predaceous on larvae of other mosquitos. *Ochlerotatus* (*Aëdes*) *abfitchi,* Felt, bred abundantly in open, grassy pools, in association with *O.* (*A.*) *aurifer,* Coq. Larvae of *O.* (*A.*) *canadensis,* Theo., were taken in stagnant water near the village. *O.* (*A.*) *subcantans,* Felt, appeared in small numbers. *O.* (*A.*) *sylvestris,* Theo., was obtained between June and August, the larvae being very abundant after heavy rains. *O.* (*A.*) *impiger,* Walk., bred in small temporary woodland or swamp pools in association with *O. canadensis.* It did not appear to be troublesome, thus differing from another woodland form, *O.* (*A.*) *trivittatus,* Coq., which was reported to be a persistent biter. *O.* (*A.*) *triseriatus,* Say, was found in tree-holes on a few occasions. *Culex pipiens,* L., was common in stagnant water in barrels, etc., and in one instance was found in a tree-hole with *O. triseriatus. C. restuans,* Walk., occurred in artificial collections of water, but in smaller numbers than the preceding species. *C. territans,* Walk., was apparently abundant and troublesome during the warm months; the breeding places were similar to those of *C. restuans* and *C. pipiens. C. dyari,* Coq., was met with on one occasion only. Adults of *Taeniorhynchus* (*Mansonia*) *perturbans,* Walk., were observed between 14th June and 30th August. The larvae were associated with the water plants, *Typha latifolia* and *Docodon verticillatus,* from which they derived their air supply.

The following recommendations were made for controlling mosquitos in this region:—(1) burning sedge and cat-tail areas in winter and cutting the same at the end of May; (2) filling-in small permanent pools in the residential section; (3) using heavy fuel oil on the breeding places.

Garden (G.). **Report by the Senior Veterinary Officer.**—*Ann. Rept. Dept. Agric. Nyasaland for the Year ended 31st March 1916, Zomba,* 30th June 1916, pp. 17–18. [Received 4th September 1916.]

Sporadic outbreaks of trypanosomiasis among cattle occurred in the Zomba, Blantyre and Mlanje districts, though only the last-named is likely to prove a permanent centre of infection. Cases of the disease were also met with in the Fort Johnston district and at Chiromo. Tick-borne diseases showed a considerable decrease in prevalence; cases occurred in the Zomba and Blantyre areas, and in outlying parts of the Mlanje district in which facilities for dipping were wanting. In areas in which dipping was regularly carried out, a marked diminution in the number of *Stomoxys* and other biting flies was observed.

This is attributed to the action of the arsenical dip, which, after continuous treatment, permeates the outer layers of the hides of cattle, and thus becomes absorbed by ticks and biting flies. It is believed that *Glossina* may also be controlled by this means.

MASON (C.). **Report of the Government Entomologist.**—*Ann. Rept. Dept. Agric. Nyasaland for the Year ended 31st March 1916, Zomba*, 30th June 1916, pp. 19–22. [Received 4th September 1916.]

On account of the outbreaks of trypanosomiasis among transport cattle on the Zomba-Blantyre road investigations were begun to determine whether a fly area existed in the highlands, from which infection could be carried to the cattle. The investigations are still incomplete. *Glossina brevipalpis* was probably responsible for the cases of trypanosomiasis at Mlanje. Four or five species of *Stomoxys* and a number of Tabanids were collected. A Bembecid wasp was predaceous on *Tabanus denshami*, *T. taeniola*, *T. taeniola* var. *variatus* and *T. fuscipes*. An Asilid was noted to attack *T. fuscipes*, and another Asilid, *Alcimus rubiginosus*, attacked *Chrysops woodi*. Two species of SIMULIIDAE were taken on cattle and a third on cattle and man. HIPPOBOSCIDAE included :—*Hippobosca fulva* on impala and bushbuck, *Lynchia maura* on ring-dove, and *Echestypus paradoxus* on bushbuck and warthog.

NOBBS (E. A.) & SINCLAIR (J. M.). **Compulsory Dipping.**—*Rhodesia Agric. Jl., Salisbury*, xiii, no. 4, August 1916, pp. 466–473.

The Compulsory Dipping Ordinance of 1914 is now in operation on about 600 out of the 2,000 occupied farms in the country, including parts of the native districts of Salisbury, Mazoe, Hartley, Marandellas, Umtali and Melsetter. The necessity for the more general practice of regular dipping is emphasised. Explanatory details and methods of procedure in any area to which it is desired to apply the Ordinance are given. Attention is called to the fact that dipping in terms of the Ordinance implies the use of an approved solution of a certain strength and purity. The intervals between each dip should not exceed a week throughout the six months during which ticks are most abundant. Financial assistance in the matter of erection of dipping tanks by private individuals may be provided by the Legislative Council or by the Land Bank. The erection of public dipping tanks at centres through which many cattle pass is not advocated, since such a tank would not ensure regular dipping and would involve the contact of clean with infected animals, while owners would be likely to retain milch cows, calves and sick animals at home.

SINCLAIR (J. M.). **Veterinary Report.**—*Rhodesia Agric. Jl., Salisbury*, xiii, no. 4, August 1916, pp. 546–549.

Outbreaks of African coast fever occurred during May in the Mazoe and Melsetter districts. In the Mrewa district a further outbreak occurred, involving the death and destruction of 51 head of cattle.

Compulsory dipping of all cattle over a large area round the infected centre was enforced and the necessary dipping tanks were erected. Tick-infested cattle were found in the Gwelo district and three-day dipping was instituted there. During June the remaining cattle on the infected farm in the Mazoe district were destroyed. In the Mrewa district cattle removed from infected to clean ground remained healthy; the dipping interval was extended from three to five days. The existence of African coast fever was demonstrated in the Gwelo district.

CHRISTOPHERS (S. R.). **A New Anopheline with Unspotted Wings from Mesopotamia** (*Anopheles lukisi*). — *Ind. Jl. Med. Research, Calcutta,* iv, no. 1, July 1916, pp. 120–122. [Received 12th September 1916.]

Anopheles lukisi, sp. n., obtained together with *A. sinensis* var. *mesopotamiae* from Amara, is described. Both these species were found to bite during the evening.

AWATI (P. R.). **Studies in Flies. Contributions to the Study of Specific Differences in the Genus** *Musca*. **2. — Structures other than Genitalia.**—*Ind. Jl. Med. Research, Calcutta*, iv, no. 1, July 1916, pp. 123–139, 10 figs., 2 tables. [Received 12th September 1916.]

The generic characters of the genus *Musca* are described. The following characters, in addition to the genitalia, have been found of value in specific identification:—Chaetotaxy, differences in the ground colour of the abdomen, in the arrangement of the shimmering areas on the abdomen and of the thoracic stripes, variations in the fifth sternite of the female, the presence or absence of spines beyond the anterior cross vein, the number of spines on the humeral vein, and the position of the fovae of the antennae. A key to the identification of the species of the genus, based on these characters, is given.

GILL (C. A.). **Malaria in Muscat.**—*Ind. Jl. Med. Research, Calcutta,* iv, no. 1, July 1916, pp. 190–235, 4 plates, 1 chart, 2 maps, 10 tables. [Received 12th September 1916.]

The investigations here recorded were confined to a very limited area in and around Muscat. Mosquito breeding places in the immediate vicinity of the camp were extremely limited, owing to the scarcity of vegetation and the absence of a native village. Rain water was however able to collect and remain in depressions in the surrounding volcanic rocks. During 1915, owing to the slight rainfall, these pools dried up almost entirely, and thus further reduced the number of breeding places. Wild animals included a few Arabian gazelles, hares and foxes; domestic animals included camels, donkeys and cattle. Rats were abundant and troublesome. The insect fauna included house-flies, *Stomoxys calcitrans*, especially in November and December, blue-bottles, *Phlebotomus* sp., and a bug, *Triatoma* (*Conorhinus*) sp., as well as the following Anophelines:—*Anopheles* (*Myzomyia*) *culicifacies*, Giles; *A.* (*Neocellia*) *stephensi*, Liston; *A.* (*M.*) *rhodesiensis*, Theo.; *A.* (*M.*) *funestus* var. *arabica*, Christophers, and *A.* (*Pyretophorus*) *cinereus*, Theo. Ticks, fleas, and lice occurred in small numbers. *A. culicifacies* was found to breed freely in surface water collections and in shallow wells between October and March inclusive. Adults were taken in the vicinity of the camp in small numbers from November 1914 to February 1915. Larvae of *A. stephensi* were present in two situations, one a cistern, the other a brackish pool, between October and December 1915; no adults were observed. *A. rhodesiensis* was present in abundance in pools of surface water during March 1915. Breeding was rapid until the first half of May, then decreased in activity until October. During that month larvae were found in wells in small numbers. Adults were taken in Muscat Fort in March and April. This species probably attacks man. *A. funestus* var. *arabica* was confined to underground aqueducts, in which situations larvae were fairly numerous between November and April. Adults were captured from November to January; they appeared to rest during the day on the sides of the aqueducts immediately above the breeding places. Larvae of *A. cinereus* were present in a tank in Muscat during December. The breeding places of Anophelines were thus mainly of a permanent character, and breeding was continuous throughout the year, except during the hottest months.

An examination of civil and military fever statistics showed that a marked decline in malaria occurred in June, and few cases were observed between this month and September. During this period high temperatures and a high degree of humidity prevailed. Malaria was very prevalent in April and May, when a high temperature was accompanied by a relatively low humidity. Although Anophelines were present almost throughout the year, their numbers were scarcely enough to bring about a rapid spread of the disease. The evidence collected in 1915 seemed to show that the majority of cases of fever among the troops were relapses due to previously acquired infection. The civil population however showed a high degree of infection, and it must therefore be assumed that active transmission of the disease may occur in certain years. The tendency to relapse may be occasioned to a greater or less extent by the climatic and physiographical conditions. Cases of blackwater fever occurred among the civil population throughout the greater part of the year; the disease was associated with intense malaria and chiefly affected indigenous inhabitants and old residents.

Anti-malarial measures were almost entirely neglected by the civilians of Muscat. The following recommendations are made:—(1) extension of the pipe system of water supply, thus decreasing the necessity for private wells; (2) the proper covering of wells, tanks, etc.; (3) the use of mosquito-nets throughout the year, and the screening of windows, etc., with wire gauze. In the camp, the covering of wells and the filling in of a collection of surface water resulted in an appreciable decrease in the numbers of mosquitos. The access of mosquitos to troops under canvas could be prevented to a considerable degree by providing a double screen of mosquito-netting at the door of the tent.

The system of quinine administration is discussed. The scheme consisted of the continuous use of relatively small doses for a prolonged period. No attempt was made to administer the drug except to known malaria cases and to those showing enlargement of the spleen. This method of procedure resulted in a gradual decrease in the number of cases of fever treated.

Cornwall (J. W.). A Contribution to the Study of Kala-Azar. (ii).—*Ind. Jl. Med. Research, Calcutta,* iv, no. 1, July 1916, pp. 105–119, 1 plate. [Received 12th September 1916.]

Further experiments were made in order to determine whether *Cimex hemipterus* (*rotundatus*) is able to transmit *Leishmania donovani,* the parasite of kala-azar (1) by biting, (2) through the medium of its faeces, or (3) by being devoured by another insect or vertebrate. In the first case, infected bugs were unable to inoculate a sterile culture fluid either with flagellates or with bodies capable of developing into flagellates. In the second case, if a viable cystic form of the parasite were present in the faeces, infection would be transmitted if the faeces came into contact with feeding punctures, wounds, etc., on the skin of the host. As yet no such forms have been found in the rectum or faeces of the bug, and it is therefore improbable that infection can be carried by this means. A number of flagellate and non-flagellate forms were found in the rectum, but these all showed signs of degeneration and are believed by the author to have reached this position accidentally from the stomach. With regard to the third case, ants are known to eat bugs and it is thus possible that food can be contaminated by these insects. The common species of cockroaches in the region of the Nilgiri Hills do not attack bed-bugs or their eggs. Further observations are needed on the capacity of vertebrate enemies of bed-bugs to carry infection.

Investigations were carried out on the formation of the thick-tailed stage in the life-history of *L. donovani* and *L. tropica.* This form only arises in the stomach and intestine of *C. hemipterus* and is produced more abundantly in the presence of human blood. Similar forms were not produced experimentally in *Xenopsylla, Margaropus* and *Triatoma* (*Conorhinus*) *rubrofasciata.* It is suggested that similar investigations should be conducted on *Simulium, Phlebotomus,* etc. If the short-tailed stage is a developmental or resistant form, then its presence in the bug would indicate that the latter is concerned in spreading both kala-azar and oriental sore. If, on the other hand, this stage appears in the stomachs of other insects as well as that of the bug, it may be regarded as due to an unfavourable environment, and in consequence, the bug would not be responsible for the spread of disease. A flagellate infection which had died out from the stomach of the bug was not renewed after a second feed on sterile blood. Cystic forms capable of becoming flagellates do not therefore remain in the stomach. No intracellular stages of *L. donovani* were found to occur in the stomach.

Triatoma rubrofasciata was fed on citrated human blood and flagellate culture. Very few living flagellates were found in the stomach at the end of two days and none at the end of four days. *T. rubrofasciata* is therefore not an intermediate host of *L. donovani.* The fresh serums of man, goat, sheep and guinea-pig were fatal to living flagellates of *L. donovani,* but except in the case of the goat, the unfavourable action was destroyed by heating to 131° F. for half an hour. Few ill effects were observed from the serum of rabbit, hen, dog and cat.

When bugs were allowed to feed on the ulcer of oriental sore, from which cultures of *L. tropica* had previously been made, subsequent dissection failed to show the presence of flagellates in them. It is thus provisionally concluded that the bed-bug is incapable of transmitting either *L. tropica* or *L. donovani* by biting or through the medium of its faeces.

Reference is made to the value of the artificial method of feeding bugs, fleas, mosquitos, etc., for obtaining a heavy infection by the parasites under investigation.

CREEL (R. H.). **Fumigation by cyanide gas.** — *Milit. Surgeon, Washington, D.C.*, xxxix, no. 3, September 1916, pp. 282–287.

The main points in this article may be found in a preceding paper [see this *Review*, Ser. B, iv, p. 155]. It is specially noted that mosquitos are very susceptible to cyanide gas, while lice are very resistant to it.

MITZMAIN (M. B.). **Anopheles infectivity experiments.**—*Public Health Repts., Washington, D.C.*, xxxi, no. 35, 1st September 1916, pp. 2325–2335, 3 figs.

In 17 experiments in which human beings were employed to test the infectibility of *Anopheles punctipennis* with *Plasmodium vivax*, 14 cases of malarial fever resulted. The sporozoites in the mosquitos used developed in from 10 to 22 days after the definite hosts were given an opportunity to bite a patient harbouring a scanty number of mature tertian gametocytes. In an attempt to infect several persons with a single specimen of *A. punctipennis*, one mosquito proved to be the sole infective agent in one experiment and another proved to be the sole agent in three experiments. When applied to the same person, these two individuals transmitted the infection in five cases, while one of them used with a third mosquito succeeded in infecting four persons. In nine instances in which two mosquitos succeeded in transmitting malaria, at least one of the pair was proved to be capable of causing the disease when used singly. In 11 experiments short exposure to the bites was sufficient to cause successful transmission of the disease. In all the successful inoculations only tertian infection was produced. The existence of *P. vivax* was demonstrated microscopically.

KNAB (F.). **A New Mosquito from the Eastern United States.**—*Proc. Biol. Soc. Washington, Washington*, xxix, 6th September 1916, pp. 161–164.

Culex brehmei, sp. n., found in New Jersey, is described. Eggs, larvae, and pupae were obtained from a spring in the woods, the temperature of the water being 38° F. The first pupae were collected on 25th April; the first male emerged on 29th April, and the first female on the following day. The first eggs of the next generation were taken on 2nd May, and larvae began to emerge on the next day. The first pupae of the same generation were found on 15th May, and adults began to emerge on 17th May. Breeding apparently is continuous throughout the season. Females were found to feed readily on human blood.

HERMS (W. B.). **Medical and Veterinary Entomology.**—*New York*, MacMillan & Co. 1915, pp. xii + 393, 228 figs. Price 17*s*. net.

This book is based upon the author's lecture notes as teacher of parasitology in the University of California and in the San Francisco Veterinary College and includes some original work hitherto unpublished. The preface states that it is not intended to be a comprehensive treatise, but rather an attempt to systematise the subject, serving at the same time as a handbook for those professionally interested. To this end, detailed accounts of experiments and methods of investigation are included. An outline of the subject with chapters on parasites, insect anatomy, especially of the mouth-parts, the classification of insects, and the manner in which they carry and cause disease occupy 36 pages. Among individual insects and their relation to the disease, cockroaches as contaminators of food, and the beetles, *Lachnosterna* and *Melolontha*, as the intermediate hosts of the tapeworm, *Echinorhynchus gigas*, in pigs are mentioned. The chapter on lice deals with both Anoplura and Mallophaga, their hosts, the diseases they transmit and the most effective methods of control. A similar chapter deals with bed-bugs and blood-sucking Reduviids. The chapters on mosquitos and *Phlebotomus* occupy 62 pages and contain a large amount of condensed information with a key to the classification of mosquitos after Theobald. Methods of control are fully dealt with, and tables are given showing the excellent results obtained from anti-mosquito work in Havana, Ismailia and Panama. Another chapter is devoted to Tabanids and horse-flies, including a key to the North American TABANIDAE after Hine. The house-fly and its control naturally claim a large amount of attention ; the portion of this section dealing with manure heaps might be expanded with advantage. The effect of the heat produced by fermentation on fly larvae and the use which can be made of it in checking the breeding of flies in manure heaps and at the same time preserving the agricultural value of the manure is not referred to, while some of the methods advised for control involve the destruction of the material as a fertiliser. The chapter on blood-sucking Muscids contains a brief account of some of the species of *Glossina* and their relation to trypanosomiasis, while *Stomoxys calcitrans* is dealt with at length. Six species of fleas are illustrated, and the methods for controlling the squirrels, *Citellus douglasi* of the Pacific coast and *C. beecheyi* of the interior, both of which are reputed plague-carriers, are given in some detail. The chapter on ticks devotes special attention to *Margaropus annulatus*, *Dermacentor venustus* and the Argasids. The various mites which attack man and animals and the methods of treatment are fully dealt with, and the book concludes with a chapter on venomous insects and Arachnids. To those interested in the subject, this book should prove a valuable work of reference, while in many cases the foot-notes supply information as to original papers when further details are required.

FERRIS (G. F.). **Notes on Anoplura and Mallophaga from Mammals, with Descriptions of Four New Species and a New Variety of Anoplura.**—*Psyche, Boston, Mass.*, xxiii, no. 4, August 1916, pp. 97–120, 12 figs.

This paper records a number of Anoplura from North America, the following being described as new :—*Neohaematopinus antennatus*, Osborn, var. *semifasciatus*, n., from *Sciurus douglasi albolimbatus*; *Fahrenholzia tribulosa*, sp. n., from *Perognathus californicus*; *Enderleinellus kelloggi*, sp. n., from *S. griseus nigripes E. uncinatus*, sp. n.; from *Glaucomys sabrinus lascivus*; and *Hoplopleura hirsuta*, sp. n., from *Sigmodon hispidus*.

Lahille (F.). **Notas sobre los Argásidos chilenos.** [Notes on Chilian Argasidae.]—*Anales Zool. Aplicada, Santiago de Chile*, ii, no. 1, 30th April 1915, pp. 5–11, 1 plate. [Received 4th September 1916.]

In 1909 the author obtained specimens of *Ornithodoros talaje*, Guér. (*reticulatus*, Gerv.), on horses near Santiago. *Argas persicus* also occurs both in Chile and Argentina, and in 1913 the author described a variety of this species, *A. persicus* var. *porteri*, from San Bernardo in Chile.

papatac

Morales (R.). **El** *Phlebotomus papataci* **en Guatemala.** [*Phlebotomus papatasii* in Guatemala.]—*Anales Zool. Aplicada, Santiago de Chile*, iii, no. 1, 29th February 1916, pp. 27–29. [Received 4th September 1916.]

The Psychodid, *Phlebotomus papatasii*, has been found in Guatemala at an altitude of 1,200 feet, though the presence of three-day fever has not yet been reported from there. *Chironomus calligraphus*, two species of *Megarhinus*, one of *Janthinosoma*, one of *Stegomyia*, one of *Sabethes*, and several of *Culex*, also occur.

Lima (A. da Costa). **Contribução para o estudo da biolojia dos culicidas. Observações sobre o respiração nas larvas.** [A contribution to the study of the biology of Culicidae. Observations on the respiration of the larvae.]—*Mem. Inst. Oswaldo Cruz, Rio de Janeiro*, viii, no. 1, 1916, pp. 44–49, 3 figs. [Received 9th September 1916.]

In an addendum to a paper on the respiration of Culicidae [see this *Review*, Ser. B, iii, p. 70] S. K. Sen has criticised the author's experiments [see this *Review*, Ser. B, ii, p. 107]. The several points of criticism are dealt with and Dr. da Costa Lima describes further experiments confirming his earlier results.

In British Guiana, H. W. B. Moore observed that the larvae of *Taeniorhynchus* (*Mansonia*) *titillans* were in the habit of settling on *Pistia stratiotes*. It has been recently found that the larvae of this mosquito are unable to live exclusively on air dissolved in water, but that when plants of *P. stratiotes* were placed in the same submerged tube with them, they remained near the leaves and roots and lived for three or four days. Attention is called to the fact that the branchial leaflets of *T. titillans* have a reduced tracheal ramification.

Muto (A.). **Nuovo metodo di sterilizzazione entomo-parassitario.** [A new method of sterilisation against insect parasites.]—*Ann. d'Igiene, Roma*, xxvi, no. 8, 31st August 1916, pp. 493–508, 5 figs.

A few notes are given on the biology of lice, which, it is pointed out, are unable to move about on perfectly smooth surfaces. This explains why silk underclothing, being smoother than cotton or wool, has been advised as a prophylactic. After reviewing the various methods employed against lice, a means of using creolin and cresol, especially the former, is described. The apparatus consists of a wooden cupboard and a boiler for generating the creolin vapour. The cupboard is about 6 feet high by 3 feet wide and 1½ feet deep and can be instantly taken to pieces and as quickly put together again. When dismantled it forms two flat packages which are strapped on either side of a mule, on the back of which the 4-gallon boiler is also carried together with its furnace. For use, the cupboard is set up and connected up by a tube with the boiler placed alongside of it on the ground. The articles to be disinfected are hung on hooks, care being taken that they are not too closely packed and that they hang at least 2 inches above the mouth of the delivery tube. After closing the cupboard, 7 pints of a 10 per cent. saponaceous solution of creolin is poured into the boiler and the fire is lighted, a few pieces of wood being sufficient for the firing. A small hole in one side of the cupboard allows a thermometer to be introduced, so that the temperature may be watched; on 113° F. (45° C.) being reached, the time must be taken and 15 minutes at that temperature must be allowed in order to kill both the lice and their eggs. When starting work not more than half an hour is required to bring the liquid to boiling point; succeeding operations require even less time, for the liquid is already hot. About 14 oz. of solution is evaporated each time, but the boiler is fitted with a funnel which allows it to be replenished without interrupting the work. In actual practice 300 sets of uniform and equipment were dealt with in six hours. This apparatus may be taken to and erected at advanced outposts and the soldier need not leave his station, only requiring to shelter in a tent for the short time necessary, which gives him an opportunity of applying an insecticide to his person. The garments are not rendered sufficiently damp to injure the man's health even when put on immediately. A bibliography of 33 works is given.

MacDougall (R. S.). **Insect and Arachnid Pests of 1915.**—*Trans. Highland & Agric. Soc. Scotland*, 1916, pp. 1–33, 13 figs. [Reprint received 13th September 1916.]

Notes are given on the habits, life-history, and methods of control of *Pediculus humanus* (*vestimenti*) (body louse). The following dressings are recommended for use against *Haematopinus asini* (*macrocephalus*) and *Trichodectes parumpilosus* (*equi*) on horses:—(1) arsenious acid, 1 oz., soft soap, 2 ozs., carbonate of soda, 1½ ozs., water, 2 pts., diluted to 5 gals. before use; (2) 2 per cent. creolin solution; (3) perchloride of mercury, 1 part in 1,000 of water, for application on the legs only. Mange in horses, due to *Sarcoptes scabiei* var. *equi*, *Psoroptes communis* var. *equi*, and *Chorioptes* (*Symbiotes*) *equi*, may be treated with the following preparations:—(1) sulphur, oil of terebinth, spirits of tar, and liquor potassae, 1 oz. of each, rape oil, 1 pt.; (2) sulphur, 2 parts, potassium carbonate, 1 part, sperm oil, 8 parts. Sarcoptic mange has been recorded on dairy cows and has passed from them to cowmen. The dressing recommended consists of 1 part sulphur and 4 parts vaseline or fish oil.

Tineola bisselliella was reared from dog-biscuit and casein and appeared to thrive better on these foods than on fur and woollen materials. The Ptinid, *Niptus hololeucus*, was also obtained from casein. *Trichophaga tapetiella* emerged in considerable numbers during the summer from stored deer hides.

FROGGATT (W. W.). **A New Parasite on Sheep Maggot Flies. Notes and Description of a Chalcid Parasite** (*Chalcis calliphorae*).—*Agric. Gaz. N.S.W., Sydney,* xxvii, no. 7, July 1916, pp. 505–507, 1 plate.

Mr. T. McCarthy, Entomological Assistant at the Government Sheep-fly Experiment Station at Wooloondool, reported the discovery early in April of a new Chalcid parasite attacking maggots of the blowfly *Anastellorhina augur* (*Calliphora oceaniae*). This is described and figured under the name, *Chalcis calliphorae*, sp. n. This parasite is much larger than the common *Nasonia brevicornis*; maggots parasitised by it are able to pupate, the adult Chalcids emerging from the puparia. Though only a single individual infests each puparium and the increase of this species is not so rapid as the more prolific *Nasonia*, it may be of considerable economic importance. It is hardy, easy to handle and breed in captivity, and will stand a long journey by post.

CURLEWIS (A. W.). **Sheep Dips.**—*Jl. Dept. Agric. Victoria, Melbourne,* xiv, no. 7, July 1916, pp. 423–432, 8 figs. [Received 15th September 1916.]

This paper contains particulars and plans of tanks suitable for dipping small or large flocks of sheep.

BALFOUR (A.). **The Medical Entomology of Salonica.**—*Published by Wellcome Bur. Sci. Research, London,* 1916, 25 pp., 31 figs. [Received 13th September 1916.]

In an address delivered to the Salonica Medical Society, the author deals briefly with the life-history, habits, and methods of control of the following insects and Arachnids occurring in this region:—*Musca domestica, Fannia canicularis, Lucilia caesar, Calliphora erythrocephala, Stomoxys calcitrans, Sarcophaga* sp., *Hippobosca, Stegomyia fasciata, Anopheles, Culex, Phlebotomus papatasii, Simulium, Pediculus* spp., *Cimex* spp., *Pulex irritans* and *Sarcoptes scabiei.*

Ligue Sanitaire Française. [French sanitary league.] — Circulars nos. 3, 4, 5; 1st & 15th May, 1st June 1916. Offices, 72, Rue de Rome, Paris.

Under the general heading " Advice on practical hygiene," the French sanitary league [see this *Review*, Ser. B, iv, p. 17] has issued three circulars on fly control. The first, by H. G. Richter, deals with the measures necessary to destroy or drive away flies in rooms tenanted by tuberculous patients, flies being the principal agents in the transmission of tuberculosis. All refuse must be burnt, the windows of the patient's room must be fitted with screens, the walls and ceiling must be papered, painted or whitewashed a pale blue colour, the sputum must be received in an antiseptic fluid in a container kept under a fly-proof cover, and fly-traps must be placed in the room. Instead of traps, plates may be half-filled with a mixture containing 9 oz. of milk, 9 oz. of water and two spoonfuls of formol, a slice of bread being placed in the plate for the flies to settle on. The second bulletin refers to the method of fly control originated by Levy and Tuck [see this *Review*, Ser. B, ii, p. 72] in which a heap of manure is placed on an open-work platform standing in a shallow pan of masonry which drains into a liquid-manure pit fitted with a pump enabling the heap to be wetted as required. To ensure an efficient destruction of the larvae, the height of the manure heap must not be more than about 5 feet 6 inches, and to deal with 1,060 cubic feet of manure, a platform of 21½ square yards surface would be needed. Cheapness and efficiency are the main points of this system. The third circular enumerates the measures required to destroy or drive away flies in stables and cow-houses.

CARTER (H. R.). **Notes from Field Work.—Malaria Survey of Impounded Waters.**—*Southern Med. Jl., Birmingham, Ala.*, ix, no. 8, August 1916, pp. 708–711.

Observations on the seasonal breeding of *Anopheles quadrimaculatus* and *A. punctipennis* made from May to October 1915 gave the following results:—A count made from 26th May to 26th June showed 2 *A. quadrimaculatus* and 628 *A. punctipennis.* The same region surveyed from 16th August to 20th September showed a very different distribution of species, viz:—Of 600 individuals, 78 per cent. were *A. quadrimaculatus*, 20 per cent. *A. punctipennis* and 2 per cent. *A. crucians.* A further examination, made from 26th to 30th October, showed 19 per cent. *A. quadrimaculatus* and 71 per cent. *A. punctipennis.* The *A. punctipennis* larvae were, if anything, less abundant than in September, so there must have been a marked decrease of *A. quadrimaculatus*, which appeared to have a distinct predilection for ponds, in preference to marshes and running water. A survey of the Anophelines found in houses in the day-time showed that *A. quadrimaculatus* was frequently met with in inhabited houses, as well as in other situations. *A. punctipennis* was very rare in inhabited houses, though often met with in outhouses, etc.

SCHØYEN (T. H.). **Beretning om skadeInsekter og plantesygdommer i landog havebruket 1915.** [Report on the injurious insects and fungi of the field and the orchard in 1915.]—*Kristiania*, 1916, pp. 37–92, 30 figs.

In this report are included a few records of insect pests of man and animals. Advice against an invasion of the Hippoboscid, *Stenopteryx hirundinis*, was asked from near Christiania. *Ornithomyia avicularia* was found to occur very commonly on ptarmigan. Other household pests were *Phyllodromia* (*Blatta*) *germanica*, *Blatta americana* which was very troublesome in a cargo of corn from the Mediterranean, *Glyciphagus domesticus*, and *Chelifer cancroides*, the latter having invaded a house from a neighbouring hay-loft.

Cimex (*Acanthia*) *lectularius* was reported from Christiania and elsewhere.

NOTICES.

The Editor will be glad to receive prompt information as to the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion the adoption of which would increase the usefulness of the Review.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Editor, 89, Queen's Gate, London, S.W.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent to Messrs. DULAU & Co., Ltd., 37, Soho Square, London, W.

CONTENTS.

PAGE.
The Introduction of Yellow Fever by Land into the Gold Coast .. 165
The Introduction of Yellow Fever into the West African Colonies by Sea 165
The Treatment of Mange in Army Horses in France 165
Fleas as a Menace to Man and Domestic Animals 166
Control of Pigeon and Poultry Lice in the U.S.A. 166
Dermatitis due to *Paederus crebripunctatus* in British East Africa.. 167
The Bionomics of Blow-flies and House-flies in England 167
Measures against House-flies in England 167
The Treatment of Manure to control House-flies in England .. 168
Experiments with Baits for House-flies in England 168
New Hippoboscids from North America 169
Mosquitos in New York 170
Insect-borne Diseases of Stock in Nyasaland 170
Biting Flies in Nyasaland 171
Compulsory Dipping in Rhodesia 171
Cattle Dipping against African Coast fever in Rhodesia 171
A New Anopheline Mosquito from Mesopotamia 172
Specific Differences in the Genus *Musca* 172
Mosquitos and Malaria in Muscat 172
Experiments with *Cimex hemipterus* and Kala-Azar 174
Fumigation with Cyanide Gas 175
Experiments with *Anopheles punctipennis* and *Plasmodium vivax* in the U.S.A 175
A New Mosquito from the Eastern United States 175
Medical and Veterinary Entomology (Review) 176
New Anoplura from Mammals from North America 176
Argasid Ticks in Chile 177
Phlebotomus papatasii and Mosquitos in Guatemala 177
Observations on the Respiration of Mosquito Larvae 177
The Control of Lice 177
Insect and Arachnid Pests of 1915 in Scotland 178
Chalcis calliphorae, a new Parasite of Sheep Maggot Flies in Australia 179
Sheep Dipping Tanks in Australia 179
The Medical Entomology of Salonika 179
Measures against House-flies in France 179
Seasonal Distribution of Anophelines in the U.S.A. 180
Injurious Insects in Norway 180

VOL. IV. Ser. B. Part 12.—pp. 181-196. DECEMBER, 1916.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:
SOLD BY
DULAU & CO., Ltd., 37, SOHO SQUARE, W.

Price 6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

RT. HON. LEWIS HARCOURT, M.P., *Chairman.*

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.

Mr. E. E. Austen, Entomological Department, British Museum (Natural History).

Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.

Mr. E. C. Blech, C.M.G., Foreign Office.

Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.

Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.

Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.

Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).

Professor H. Maxwell Lefroy, Imperial College of Science and Technology.

The Hon. Sir John McCall, M.D., Agent-General for Tasmania.

Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.

Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.

Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.

Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.

Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.

Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.

Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.

Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.

Mr. H. J. Read, C.B., C.M.G., Colonial Office.

The Honourable N. C. Rothschild.

Mr. Hugh Scott, Curator in Zoology, Museum of Zoology, Cambridge.

Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.

Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.

Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.

Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.
Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.
Dr. Guy A. K. Marshall.

Assistant Director.
Mr. S. A. Neave.

Assistant Editor.
Mr. W. North.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.

Publication Office.—89, Queen's Gate, London, S.W.

Kofoid (C. A.) & McCulloch (Irene). **On *Trypanosoma triatomae*, a New Flagellate from a Hemipteron Bug from the Nests of the Wood Rat, *Neotoma fuscipes*.**—*Univ. California Publications in Zoology, Berkeley,* xvi, no. 10, 18th February 1916, pp. 113–126, 2 plates. [Received 2nd October 1916.]

The bug, *Triatoma protracta*, Uhler, found in the nests of *Neotoma fuscipes*, harbours in its digestive tract, *Trypanosoma triatomae*, sp. n., with blood which is possibly derived from the rat. Crithidial and trypaniform stages, which are probably later forms in the life-cycle of the trypanosome, were also present.

Bishopp (F. C.). **Flytraps and their Operation.**—*U.S. Dept. Agric., Washington, D.C.,* Farmers' Bull. no. 734, 10th June 1916, 13 pp., 7 figs. [Received 3rd October 1916.]

This bulletin describes and illustrates the construction of several types of traps for use against house-flies, stable-flies, etc. Garbage tins should preferably be fly-proof ; if they are not so, a balloon trap is recommended for placing over a hole in the lid. Manure pits or boxes for use in towns should be made of concrete or heavy planks. The roof should be provided with one or more holes over which conical traps can be fitted. Flies maturing in or attracted to the manure thus pass upwards into the better illuminated trap. A modification of the tent trap has been adapted for use in windows and is constructed in such a way as to capture flies as they enter or leave the room ; this type of trap has been found very useful in stables.

Baits such as milk, beer, etc., are much more attractive to house-flies when actively fermenting than when fresh. Home-made malt extract, prepared by heating to 160° F. a mixture of 2 lb. ground malt and 1 U.S. gal. water was found to be as attractive as stale beer. Blow-flies are attracted by the mucous membrane from the lining of the intestine of pigs, either used alone or with beer. The latter combination is also a valuable bait for house-flies. Bait containers should be large and shallow, the diameter being not less than 4 inches smaller than the base of the trap. For coating the surface of fly-papers for use in rooms a mixture of 2 lb. resin and 1 pt. castor oil heated together is recommended. Formaldehyde at the rate of two tablespoonfuls to a pint of equal parts of milk and water is the best poison bait for house-flies. Stale beer or molasses and water with 8 per cent. formaldehyde will probably also give good results.

Cleland (J. B.) & Ferguson (E. W.). **Researches on Plague.**—*Rept. Director-General of Public Health, New South Wales, for the Year ended 31st December 1914, Sydney,* 1916, pp. 174–175, 3 tables, 1 chart. [Received 4th October 1916.]

The examination of rats and mice was continued during the year. Plague was not found in any of the specimens, thus leaving a plague-free period since 1910. The following species of fleas were found on rats :—*Xenopsylla* (*Loemopsylla*) *cheopis*, *Ctenopsylla musculi*, *Ceratophyllus fasciatus*, and *Ctenocephalus felis*. Contrary to previous experience, *X. cheopis* was less abundant than *C. musculi*.

FERGUSON (E. W.). **Notes on Mosquitoes.**—*Rept. Director-General of Public Health, New South Wales, for the Year ended 31st December 1914, Sydney*, 1916, pp. 203–205. [Received 4th October 1916.]

The following species of mosquitos were collected from the localities of Sydney and Milson Island :—

ANOPHELINAE :—*Anopheles* (*Nyssorrhynchus*) *annulipes*, Walk., found breeding in water-holes fringed with vegetation and *A.* (*Pyretophorus*) *atratipes*, Skuse. CULICINAE :—*Stegomyia atripes*, Skuse ; *Pseudoskusea basalis*, Taylor ; *Pseudoskusea* sp. ; *Ochlerotatus* (*Scutomyia*) *notoscripta*, Skuse, breeding in water near houses and attacking man ; *O.* (*Grabhamia*) *theobaldi*, Taylor, found in the bush and attacking man ; *Grabhamia* sp. ; *Culex fatigans*, Wied., abundant between October and April, breeding in collections of water around buildings ; *C. tigripes*, Grp. ; *C. frenchi*, Theo. ; *Ochlerotatus* (*C.*) *australis*, Er. ; *O.* (*C.*) *sagax*, Skuse (?), common in belts of timber bordering the blacksoil plains ; *O.* (*C.*) *rubrithorax*, Macq., found only in the bush ; *O.* (*C.*) *occidentalis*, Skuse, breeding in wells together with *Culicada cumpstoni* and *O.* (*C.*) *milsoni* ; *O.* (*Culicelsa*) *alboannulatus*, Macq., breeding in gullies in April, August and September, also in tins near houses in April and May ; *O.* (*C.*) *vigilax*, appearing in October and becoming abundant by the end of the year, attacking man at dusk ; *Culex sitiens*, Wied. (*Culicelsa annulirostris*, Skuse), found in December and March, biting at dusk ; *O.* (*Culicada*) *milsoni*, Taylor, found only at Milson Island, where it was comparatively common throughout the summer and bred in collections of water around buildings and in wells ; *C. cumpstoni*, Taylor, var. ; *C. victoriensis*, Taylor (?), bred from a pool during December ; *C. annulipes*, Taylor ; *C. inornata*, Strickland ; *C. fergusoni*, Taylor ; *Coenocephalus concolor*, Taylor, breeding in rock pools in December.

FERGUSON (E. W.). **Notes on Tabanidae.**—*Rept. Director-General of Public Health, New South Wales, for the Year ended 31st December 1914, Sydney*, 1916, pp. 205–206. [Received 4th October 1916.]

The following Tabanids are recorded from Sydney, the Hawkesbury River, Townsville or Cape York :—

PANGONINAE : *Pangonia clavata*, Macq. ; *Erephopsis jacksoni*, Macq. ; *Diatomineura minima*, Ric. ; *D. inflata*, Ric. ; *D. brevirostris*, Macq. ; *D. auriflua*, Donovan ; *Corizoneura chrysophila*, Walk. ; *Demoplatus australis*, Ric. ; *D. trichocerus*, Macq. ; *Ectenopsis vulpecula*, Wied. ; *Silvius australis*, Ric. TABANINAE : *Tabanus vetustus*, Walk. ; *T. cinerascens*, Macl. ; *T. taylori*, Aust. ; *T. pseudo-ardens*, Taylor ; *T. nigritarsis*, Taylor ; *T. sanguinarius*, Bigot ; *T. regis-georgii*, Macq., not uncommon on cattle and horses and known to attack man ; *T. oculatus*, Ric., taken on a horse ; *T. circumdatus*, Walk., common in the bush about Sydney.

TAYLOR (F. H.). **Report of Work done during the Second Half of 1915.**—*Half-Yearly Rept. Australian Inst. Trop. Med., Townsville, Queensland, from 1st July to 31st December 1915, Brisbane,* 1916, pp. 8–10. [Received 5th October 1916.]

The following additions were made to the collection of Australian Diptera :—

SARCOPHAGIDAE :—*Sarcophaga aurifrons,* Dolesch. OESTRIDAE :—*Oestrus ovis,* L. ANTHOMYIDAE :—*Ophyra nigra,* Wied. MUSCIDAE :—*Calliphora flavipes* ; *Anastellorhina augur,* F. (*C. oceaniae,* R.–D.) ; *Pollenia stygia,* F. (*C. villosa,* R.–D.) ; *Pycnosoma* (*C.*) *rufifacies,* Macq. ; *Lucilia sericata,* Meig. TABANIDAE :—*Sylvius frontalis,* Ric. ; *S. hilli,* Taylor ; *S.* sp. n. ; *Tabanus rufinotatus,* Bigot ; *T. nigritarsis,* Taylor ; *T. mastersi,* Taylor ; *T. cinerescens,* MacL. CULICIDAE :—*Anopheles* (*Myzorhynchus*) *barbirostris,* Wulp., var. *bancrofti,* Taylor ; *A.* (*Nyssorhynchus*) *annulipes,* Walk. ; *Stegomyia hilli,* Taylor ; *S.* sp. n. ; *Ochlerotatus* (*Scutomyia*) *notoscripta,* Skuse ; *Macleaya tremula,* Theo. ; *Ochlerotatus* (*Culicelsa*) *vigilax,* Skuse ; *Culex sitiens,* Wied. ; *Lophoceratomyia,* sp. n. ; *Uranotaenia* sp.

Male examples of *Stegomyia tasmaniensis,* Str., were received from Tasmania.

EALAND (C. A.). **Insect Enemies.**—*London,* Grant Richards, Ltd., 1916, xiii + 223 pp., 53 figs., 8vo. [Price 6*s.* net.]

This book is devoted to British injurious insects and surveys the more important pests of forestry, agriculture and horticulture, as well as those of domestic animals and of stored products, with a chapter on insects which are specially injurious to man himself. The introduction, which contains a large amount of useful information, including an outline of the orders of insects, should do something to diminish the general apathy with which the subject of economic entomology is regarded by the public. About 20 pages are given to each group of pests, a few well chosen examples being selected in each case for illustration. An appendix deals briefly with the methods of using various insecticides and a bibliography, arranged according to the natural orders, gives a list of more or less readily accessible works to be consulted by those desiring further information. The index shows that 200 pests are mentioned in the book, a large proportion of which are dealt with in the text at sufficient length to give the reader substantial information as to their habits and life-history, the nature of the damage caused by them and brief practical indications as to how they may be best dealt with.

This book will be found exceedingly readable even by the uninitiated and the fact of its publication may, it is hoped, be taken as some evidence of growing public interest in a subject which so intimately concerns the welfare of mankind.

HARRISON (L.). **A preliminary account of the structure of the mouthparts in the body-louse.**—Reprint, dated July 1916, from *Proc. Cambridge Phil. Soc., Cambridge,* xviii, nos. 5 & 6, pp. 207–226, 7 figs., 1 plate. [Received 9th October 1916.]

The subject of this paper is indicated by its title. It is pointed out that while the body-louse is frequently referred to as *Pediculus vestimenti*, Nitzsch, and occasionally as *P. corporis*, de G., the name which has priority, is *P. humanus*, L. A bibliography of 29 references is given.

SHILSTON (A. W.). **Sheep Scab. Observations on the life-history of *Psoroptes communis* var. *ovis*, and some points connected with the epizootiology of the disease in South Africa.**—*Union S. Africa, Dept. Agric., Pretoria*, 3rd & 4th Repts. Director Veterinary Research, November 1915, pp. 69–98. [Received 12th October 1916.]

In the experiments described here the complete life-history of this parasite in South Africa has been worked out. The weather had very little effect on the duration of the life-cycle, which never occupied more than ten days and was usually complete in nine days. The majority of the eggs hatch after an interval of two days. The larval stage is short, nymphs usually appearing forty-eight hours after hatching and always within three days. The nymphal stage lasts from three to four days. At this time the sex could frequently be determined, the smallest individuals usually giving rise to males. Females were observed five and a half days after hatching from the egg, while males were never seen earlier than the sixth day. The proportion of males to females has been stated by Gerlach to be as one is to two ; whilst this was noticed in some cases, the females were more often three, and occasionally four times as numerous as the males. After feeding for a short time, pairing takes place, and after moulting, the female begins to oviposit nine days after hatching from the egg and may continue to do so up to the 38th day. From numerous observations it was found that a single female is capable of laying up to one hundred eggs, the number being however dependent on weather conditions. The life of the ovigerous female on the sheep is from thirty to forty days, though the longest period over which an unfertilised female was kept alive on a sheep was seven weeks, the majority of such individuals however dying in three or four weeks.

The question of the interval to be allowed between the two dippings necessary to effect a cure in sheep scab has given rise to much discussion. The present observations having shown the life-cycle to be complete in nine days, dipping should be repeated in ten days at the most. An extra day may be allowed because the fleece usually remains wet for a day after the first dipping. This interval would ensure the hatching of all eggs capable of doing so before the second dipping. Some dips, although they fail to affect the vitality of the eggs, will effect a cure in certain cases after one dipping. The explanation appears to be that the eggs hatch, but owing to the persistence of certain ingredients of the dip on the skin, the larvae are poisoned shortly after hatching ; this has been actually observed in several instances. This delayed lethal effect usually occurs in the case of dips containing an insoluble constituent in suspension, usually finely powdered sulphur. Experiment has shown that a fine deposit of this material alone over eggs placed on the skin is sufficient to kill larvae shortly after hatching. The value of such an ingredient is somewhat discounted by the difficulty of maintaining it in suspension in the fluid, and the fact that it does not reach parasites or their eggs which are protected by overlying crusts or matted wool. Observation has also shown that in certain cases after one immersion in a recognised dipping fluid, some adult parasites may survive, owing to the inability of the fluid to penetrate the hard crusts or to the presence of an excessive amount of fat. Even when using slightly alkaline fluids, which have an increased softening and penetrating effect, the second dipping should not be omitted. In cases where a flock has been badly infected for a considerable time and a number of sheep show crusts of old standing, even two dippings cannot be relied on to effect eradication, and a third dipping ten or fourteen days after the second greatly increases the chances of a complete cure. In the case of sheep with heavy fleeces special care is also necessary before the interval between the first two dips is reduced or a third dipping adopted, when an arsenical dip is being employed, owing to the increased risk of poisoning; this is especially necessary when a proprietary dip is being used.

The length of time the mites and their eggs can retain their vitality apart from the sheep is of importance, for on it depends the possibility of clean sheep becoming infected by means other than by direct contact with other infested individuals. In crusts and wool kept at room temperature in large jars the mites began to die in three or four days and usually all were dead in sixteen days after removal from the sheep, though in one instance a female was alive on the twentieth day. When kept moist at 98° F. in an incubator, the mites were very active for two or three days and eggs present in the crusts hatched. A day or two later the larvae and most of the older stages died, very few surviving more than six or seven days. In an ice-box at 32° F. all stages were dead in four days, while in a desiccator in an atmosphere free from water, at room temperature, they did not live longer than six days. The majority of the parasites left the crust soon after removal from the sheep and endeavoured to escape from the jars. In the incubator a good number of the ovigerous females laid eggs, and occasionally this was observed to occur at air temperature during the summer, but in no case at a longer interval than two days after removal from the sheep. The mites do not appear to live any longer upon shed wool or crusts in the open. When wool and adhering crusts were pulled from a sheep immediately after death and allowed to remain in an empty pen, living acari could still be found in the crusts ten days later, but were all dead fifteen days after removal.

Eggs kept at air temperature hatched after having been removed from the sheep for periods up to eight days. Batches of eggs stored for ten or more days all failed to hatch. Several batches were also placed on moist sheep faeces and returned to a sheep after ten or more days, but in no case did any of the eggs hatch. In an ice-box the eggs retained their vitality for ten days, but after twelve days all failed to hatch. It is thus no longer possible to regard the eggs of this mite as being capable of maintaining their vitality for long periods apart from sheep. The details of ten experiments dealing with this point are tabulated. Investigations showed that the mites infesting goats and rabbits could not cause scab in sheep, and that *P. communis* var. *ovis* could not infect goats, rabbits and other animals.

As in Great Britain, great variations in the prevalence of sheep scab in the course of the year are observable in South Africa, though they cannot be explained in the same way, since dipping and, in the case of Africander sheep, shearing are not carried out as general practices at definite seasons of the year. The presence of grease on sheep is believed by several South African authorities to be the chief determining factor. In carrying out the observations on the life-history of these mites it was frequently noticed that development occurred just as rapidly on the washed and shaven patches on fat sheep as on those in poor condition, but when the covers were removed and the parasites allowed to spread to the surrounding skin, multiplication was much more rapid in the case of the thin sheep than on those with excess of yolk in the fleeces, while in a few of the latter no development occurred at all. In order to observe the effect upon the mites of the presence of wool fat, two patches were prepared on the same sheep; one was washed and shaved in the usual way, while on the other the wool was only cut short and in addition the patch was smeared with yolk obtained from the wool of another sheep. On each patch six ovigerous females were placed. On the ungreased patch development occurred as usual and by the twenty-first day (from the time of hatching) the fourth generation was developing. By that time no living acari were observed on the greased patch and in the intervening period what development there was proceeded very slowly. In all cases where there was sufficient grease to soak down under the crusts development was very slow and the acari gradually died out, usually in about twenty days.

Bedford (G. A. H.). **Experiments and Observations carried out with** *Psoroptes communis* **at Onderstepoort.**—*Union S. Africa, Dept. Agric., Pretoria*, 3rd & 4th Repts. Director Veterinary Research, November 1915, pp. 99–107, 5 figs., 2 plates. [Received 12th October 1916.]

A brief description of the different stages and life-history of *Psoroptes communis* var. *ovis* is given. In testing the vitality of adults under abnormal conditions only one individual survived as long as twelve days after removal from the sheep. The longest time nymphs were kept alive was eight days and larvae three. In an incubator at 98° F. the eggs hatched in two days when the atmosphere was moist, but failed to hatch in a dry atmosphere. When kept in an ice-chest for ten days and afterwards transferred to an incubator at 98° F., they usually hatched on the third day; if kept in the ice-chest for longer periods, they all failed to hatch. Eggs kept at room temperature all hatched in five days in summer, but failed to hatch during the winter months. In dry sheep faeces at room temperature they all failed to hatch whether in summer or winter. Attempts to transmit the mites to goats, horses or calves all failed. Experiments made to determine the length of time that enclosures can remain infected after the removal of scabby sheep showed that the infection does not last more than nine days. It should therefore be safe to recommend farmers to avoid placing clean sheep in previously infected enclosures until about sixteen days have elapsed.

P. communis var. *caprae* is not such a serious pest as *P. communis* var. *ovis* and is much easier to exterminate on account of its only being able to live in the ears of the host. In September 1912 and

April 1915, a number of specimens of *P. communis* var. *bovis* were received, *Sarcoptes scabiei* var. *bovis* being also present. These are believed to be the only records of *P. communis* var. *bovis* having been found in South Africa. *P. communis* var. *cuniculi* is very common in the ears of domestic rabbits in South Africa. Attempts made to transmit this mite to horses, calves and sheep were unsuccessful.

GREEN (H. H.). **The Sulphur Sheep Dips.**—*Union S. Africa, Dept. Agric., Pretoria*, 3rd & 4th Repts. Director Veterinary Research, November 1915, pp. 115–156, 3 plates. [Received 12th October 1916.]

The author's summary of this paper on the chemistry of the sulphide dip is as follows :—

1. The caustic soda and sulphur dip, as prepared according to the recommendation of the Division of Sheep, consists of a mixture of sodium pentasulphide and sodium thiosulphate with a distribution of sulphur about four-fifths of the former and one-fifth of the latter. No monosulphide can be detected and only traces of sulphate are present. There is even the suggestion that polysulphides higher than the pentasulphide exist for a short time in the freshly prepared dip. The proportions of caustic soda and sulphur actually going into combination are approximately five to eight, and the recommended formula, 5, 20, 2½–100, provides so large an excess of free sulphur that complete utilisation of caustic soda is ensured even under somewhat careless conditions of dip-making. The presence of free caustic soda in the dip need not therefore be feared if the instructions for dip-making are carefully carried out. The preliminary mixing of the sulphur to a homogeneous cream with water is the most important step to be observed, since it is upon the intimacy of subsequent contact of the sulphur with the caustic soda solution that the reaction mainly depends. Combination takes place at comparatively low temperature, and may be completed in forty minutes at 50° C., although reaction is of course more rapid at higher temperatures. If hot water is used in the preliminary mixing, the heat evolved as the caustic soda is sprinkled in suffices to keep the mixture near the boiling point, and boiling by the application of external heat is therefore unnecessary. Boiling, however, may offer slight advantages in completing the reaction in cases where the preliminary process has been imperfectly carried out. With ordinary care a dip of correct composition always results, without boiling. If the sulphur is not properly wetted in the preliminary mixing to a cream, the bulk of it may float on the surface and cake as the caustic soda is sprinkled in, and so partly escape combination. The dip may then contain residual free alkali, but not, as might be expected, any appreciable amount of sodium monosulphide.

2. The lime-sulphur dip is analogous in composition to that of the caustic soda and sulphur dip, and consists of a mixture of calcium pentasulphide with calcium thiosulphate. In preparing the dip the ingredients must be boiled and the so-called " raw lime-sulphur dip " consists of a mixture of lime and sulphur. At least two parts of sulphur to one part of unslaked lime should be used whenever a really good sample of lime is available. If other proportions are used, the material present in smaller amount determines the solution of the other ; higher

polysulphide rather than lower being formed in all cases. If the lime is in excess, small quantities of free hydroxide may be present in the dip, but the amount is limited by the low solubility of the lime itself. Calcium pentasulphide and calcium hydroxide can, however, co-exist in the same solution even at the boiling point.

3. The loogas-sulphur dip consists mainly of a mixture of carbonates, polysulphides and thiosulphates of sodium and potassium, the amount of polysulphide being very low and the amount of carbonate relatively high. The reaction between alkaline carbonates and free sulphur is very imperfect even after prolonged boiling, and most of the sulphur used in making the loogas dip is therefore wasted by passing into the unused sediment.

4. The kind of sulphur used in dip-making is of no consequence provided it is finely divided and fairly pure. Flowers of sulphur and ground rock sulphur are equally suitable, but in the latter case a guarantee of fineness of grinding should be demanded, 65° Chancel being suggested as a reasonable specification.

5. The quality of lime used is obviously of paramount importance in making the lime-sulphur dip, but the lime generally available in the Union of South Africa appears to be of very inferior grade. The saving grace in cases where bad lime has been used in practice lies in the fact that concentrations of polysulphide much below that obtained in a well-made dip are still effective in curing scab.

6. The lime-sulphur and caustic soda and sulphur dips are reliable for the cure of scab. The loogas-sulphur dip also cured scab in the experimental trial carried out, but its composition suggests that its efficacy is largely a matter of chance, and that it is therefore not to be relied upon.

7. The active constituent of the sulphur dips appears to be the polysulphide, since thiosulphate, the only other important constituent, is itself ineffective. Free base, if accidentally present, does not contribute to the parasiticidal efficacy of the dips. A concentration of 0·6 per cent. sulphur in polysulphide form is probably always high enough to effect cure, while 0·3 per cent. showed itself as uncertain in action. The polysulphide content of the home-made lime-sulphur dip is much higher than that of the caustic soda and sulphur dip, but it is not advisable to dilute the home-made dip further than is already customary, unless the lime used is known to be of very high quality. If commercial lime-sulphur concentrates are used, dilution may be conveniently carried down to a concentration of about 0·8 per cent. polysulphide sulphur.

8. The sulphur dips if properly made (almost neutral to phenolphthalein) are harmless both to the sheep and to the wool. Solutions of polysulphide, at the concentration used in dipping, have no action on wool even on prolonged steeping. On the fleeces of dipped sheep, polysulphide is rapidly and almost quantitatively converted into thiosulphate by atmospheric oxidation, and this occurs long before the fleeces are dry. No depilatory substances are formed in detectable amount, as intermediate products in normal decomposition. If, however, free base be present in large quantity along with polysulphide, it is possible for monosulphide to be formed as an intermediate product in the course of atmospheric oxidation, and the possibility of depilatory action then arises. Minor quantities of free hydroxide, up to about

10 per cent. of the total base present in the dip, appear to be of no practical consequence, since they are converted into thiosulphate during atmospheric oxidation. The depilatory action of monosulphide or hydrosulphide is much more violent than that of free hydroxide. Under ordinary circumstances a dip would have to be very badly made indeed before the amount of residual base present could become a source of danger in practical dipping, and if reasonable care is taken in preparation, the possibility of injurious action either upon the sheep themselves, or upon their wool, is altogether ruled out.

BEDFORD (G. A. H.). **Report upon the Dipping Trials carried out with the different Proprietary and Home-made Sheep Dips in South Africa.**—*Union S. Africa, Dept. Agric., Pretoria,* 3rd & 4th Repts. Director Veterinary Research, November 1915, pp. 163–172.

Practical trials on a small scale were made with eighteen sheep dips available in South Africa. In the main series of trials two dippings at an immersion period of two minutes, and a dipping interval of nine days, were carried out. The general results showed successful cure of scab in all cases except one, when O'Gorman's dip was used at too great a dilution. At a higher strength this dip would also be effective. A few tests carried out at a shorter immersion period and longer dipping interval indicated that, although such conditions might be effective, they could not be regarded as safe. The effect of the various dips upon the general health of the sheep and upon the skin and wool was not observed to be unfavourable, except in the case of Leach's dip, where obvious intoxication occurred in ten out of twelve sheep dipped, the deaths being probably due to the high concentration recommended. At a lower concentration and with revised instructions for use, this dip would probably be efficacious and innocuous. There was every indication that home-made sulphur dips, if properly used, are both effective and harmless.

GREEN (H. H.). **Arsenical Dip-Tester.**—*Union S. Africa, Dept. Agric., Pretoria,* 3rd & 4th Repts. Director Veterinary Research, November 1915, pp. 199–214, 5 figs. [Received 12th October 1916.]

This paper describes and figures three forms of a dip-tester costing very much less than the outfits at present on the market.

GONDER (R.). **On the Transmission of** *Haemoproteus columbae.*—*Union S. Africa, Dept. Agric., Pretoria,* 3rd & 4th Repts. Director Veterinary Research, November 1915, pp. 627–632. [Received 12th October 1916.]

The author's summary of this paper is as follows :—The infectivity of the parasite, *Haemoproteus columbae,* is not hereditary in the carrier. The parasite develops in *Lynchia* (*Olfersia*) *capensis* only to the ookinete, which, through a double protoplasmic segmentation, loses all its pigment and a part of its protoplasm. So long as the ookinetes are present in the stomach of the fly, transmission of the parasite by the fly is possible. The flies clean themselves from an infection whenever they engorge on the blood of a healthy pigeon, but do not become immune against reinfection. A cleansing of the flies cannot take place so long as they feed upon infected pigeons. Artificial transmission from infected pigeons to healthy pigeons cannot be brought about by ordinary blood inoculation, but is easily effected by the injection of ookinetes cultivated in the moist chamber. Direct transmission is also possible if lung material be used.

Вѣрное средство избавиться отъ клоповъ. [A sure remedy against bugs.] — **« Сибирское Сельское Хозяйство.»** [*Agriculture of Siberia*], *Tomsk*, no. 9–10, May, 1916, pp. 210–211. [Received 12th October 1916.]

Smearing with castor oil all the places where bed-bugs are likely to collect, is stated to be an effective deterrent.

Campagne Antipaludique de 1914. [The anti-malaria campaign of 1914.]—Gouvernement Général de l'Algérie, *Algiers*, 1915, 88 pp., 2 maps, 6 diagrams. [Received 5th October 1916.]

This publication embodies 31 reports from officers conducting the anti-malaria campaign in the various districts, quinine prophylaxis and oiling being the chief control measures adopted.

Sergent (Edmond) & Sergent (Etienne). **Etudes Epidémiologiques et Prophylactiques du Paludisme ; Treizième Campagne en Algérie en 1914.** [Studies in the Epidemiology and Prophylaxis of Paludism ; 13th campaign in Algeria in 1914.]—Gouvernement Général de l'Algérie, *Algiers*, 1915, pp. 43–88, 1 map, 1 diagram. [Received 5th October 1916.]

This is an annual report on anti-malarial work in Algeria [see this *Review*, Ser. B, iii, p. 143]. In 1914 a distinct increase of malaria was observed in many localities. At certain points it was epidemic in character and fatal cases were numerous. The breeding of Anophelines was furthered by the absence of many Europeans owing to the war. The boring of artesian wells to supply the needs of intensive cultivation also proved favourable to mosquitos, as the abundant output of water does not find a sufficient outlet and stagnant pools are formed. The spring of 1914 was wet until a late date and the level of the underground water rose nearly everywhere, after being very low during preceding years. The peculiar habits of *Anopheles turkhudi* (*Pyretophorus myzomyifacies*), which is nocturnal in habit and very rare indoors by day, was again noted at Madani, where malaria was rife in 1914, though the inhabitants declared they had hardly ever been bitten. Pools near the houses swarmed with the larvae of this mosquito. Anti-larval measures gave excellent results and were only interrupted in some places in August owing to the war. Quinine prophylaxis was continued and proved of undoubted value. A quantity of literature was distributed, a specimen being reprinted in this paper.

HÉRAUD (A.). **Destruction de punaises.** [Bug destruction.]—*La Vie Agric. et Rur., Paris*, vi, no. 42, 14th October 1916, p. 296.

Advantage may be taken of the fact that bed-bugs oviposit in warm, dry places. A simple method consists in putting sheets of corrugated paper, such as is used for packing purposes, under matresses and among bedclothes. Oviposition occurs in May and if the sheets be removed, burnt, and replaced weekly during that month, a repetition of this procedure during a number of consecutive years will free buildings from this pest.

Mosquitoes—Prevention of Breeding. (Ord. May 5, 1916)—*U.S. Public Health Repts., Washington, D.C.*, xxxi, no. 38, 22nd September 1916, p. 2649.

An anti-mosquito ordinance has been enacted by the city of Tyler, Texas. No stagnant water may be maintained within the corporate limits of the city unless constantly drained, or oiled, or screened, or kept stocked with mosquito-destroying fish and free from vegetation. No receptacles containing water in which mosquitos may breed are allowed, unless subject to measures preventing breeding; this also applies to gutters, eaves, excavations, etc. All ordinances in conflict with this one are repealed. Violation of the above provisions constitutes a misdemeanour and is punishable by a fine of from 1 to 10 dollars. Every day's continuance of such violation shall be considered a separate offence.

BARBER (L. B.) **Report of the Animal Husbandman and Veterinarian.** —*Rept. Guam Agric. Expt. Sta., 1915, Washington*, 1916, pp. 23–41, 4 figs., 3 plates, 1 table. [Received 19th October 1916.]

The tick infesting cattle, horses, buffalos, goats and deer in Guam is indistinguishable from *Margaropus caudatus*. Cattle in particular are infested throughout the year, the ticks being specially abundant during the dry season. Native cattle, as a result of tick infestation and continuous inbreeding, are weak and undersized. Imported animals become rapidly infected and the resulting fever may cause death at any time, or the animal may continue to live in an emaciated condition. The conditions prevailing in Guam render the eradication of ticks or the enforcement of quarantine regulations extremely difficult. Hand-picking of ticks and the application of oil and kerosene have proved unsatisfactory. The native method, which has proved of some value, is to stand the animal in sea-water for an hour or more, then to scrape the skin to remove ticks and finally to rub in lemon juice. The treatment is repeated two or three times at intervals of from six to eight days. Plans are being made for dipping cattle at regular intervals in order to eradicate ticks. External parasites of poultry in Guam include two species of lice, *Menopon pallidum* and *Goniocotes gigas*, and the mite, *Dermanyssus gallinae*.

Flies.—*Jl. Jamaica Agric. Soc., Kingston*, xx, no. 2, February 1916, p. 58. [Received 20th October 1916.]

The following spray is recommended for use on manure heaps, walls of stables, etc. :—10 parts treacle, 2 parts arsenite of soda, 100 parts water. Treatment should be repeated at least every 10 days. For catching flies near dwellings, bundles of straw or dried grass should be hung up, after being dipped in the following mixture:—1 part honey, 1 part treacle, ½ part arsenite of soda, 10 parts water [see also this *Review*, Ser. B, Vol. i, p. 68].

Mason (F. E.). **Report of the Veterinary Pathologist.**—*Minist. Agric., Egypt., Vet. Service, Ann. Rept. for 1915, Cairo*, 1916, pp. 28–42. [Received 21st October 1916.]

Experiments on the subcutaneous injection of virulent, cattle-plague blood to produce immunity were continued until July 1915. During that month, 50 cattle were tested and no cases of plague followed the test. It was therefore concluded that a strong immunity had been conferred, lasting not less than three years.

Spirochaetosis was transmitted to fowls, ducks, turkeys and geese by *Argas persicus*. Other species of ticks collected were:—*Margaropus annulatus*, on cattle suffering from Texas and Egyptian fever; *Rhipicephalus evertsi*, on cattle with Texas fever and on donkeys with malaria; *R. oculatus*, on healthy camels; *R. sanguineus*, on dogs with malaria; *Hyalomma aegyptium*, on cattle with Texas and Egyptian fevers, on horses with malaria, and on healthy camels; *Haemaphysalis leachi*, on dogs with malaria; *Margaropus* (*Boophilus*) *australis*, on cattle with Texas fever and Egyptian fever.

A form of piroplasmosis occurred among Egyptian sheep due to a species of *Theileria*.

Cooper (H.). **Note on Spraying of Cattle with Special Dips for the Eradication of Ticks.**—*Minist. Agric., Egypt; Vet. Service, Ann. Rept. for 1915, Cairo*, 1916, pp. 45–48. [Received 21st October 1916.]

Tick-infested cattle were thoroughly sprayed with arsenical dip at the strength of 1 part dip to 150 parts water, at intervals of from 6 to 10 days. In cases of light infestation, three or four sprayings were considered sufficient; in severe cases, this number was increased to five. Subsequent examination showed that even in badly-infested animals few living ticks were present after the third application. Mature ticks died three or four days after spraying. The condition of the animals was found to improve in every case. No cases of Texas fever occurred among sprayed cattle. It is suggested that stables should be cleaned and limewashed before sprayed animals return to them. Spraying should not be carried out on wet days. Nile water was preferable to well water for diluting the dip, as the latter caused a certain amount of coagulation.

Bacot (A.). **The use of insecticides against lice.**—Separate from *British Med. Jl.*, no. 2909, 30th Sept. 1916.

This is a record of a series of experiments on the lice-killing properties of various substances made under such conditions that the lice had the opportunity of feeding whilst exposed to the influence of the substance under trial. This was effected by enclosing them in wire-gauze frames covered with thin muslin and suspending these next to the skin in various positions on the body. Trials were made with the alkaloid cytisine derived from the seeds of gorse and laburnum and possessing similar physiological properties to those of nicotine, but being much less volatile. Preliminary trials with naphthaline showed that the diffusion of vapour over the body surface under the clothing is restricted to a very small area round the centre of distribution. Thus naphthaline wrapped in motor veiling and put into a bag containing lice killed them in three hours but in another bag only half an inch from the first, only two larvae and one adult were dead out of 30 after 11 hours. By arranging a series of five cages, containing lint saturated with the remedy to be tested, and only containing lice in every alternate one, the effect of contact and diffusion were observed at the same time. Naphthaline, sulphur, cresylic acid, iodoform, vaseline with naphthaline, kerosine oil and benzole, vermijelli with cresylic acid, cytisine, vermijelli with phenol, were all tried. The general result, except in the case of vermijelli alone, was that of the lice in contact with the lint all or nearly all died. The result of these trials is to suggest that the effect by diffusion of all these substances, except possibly of naphthaline, is so slight as to reduce them all to the level of contact remedies. Thorough impregnation of the clothing would therefore be necessary to produce any effect. Naphthaline in powder is likely to be wasted, and if made into tablets, evaporates too slowly to produce any real effect, while even if clothing be impregnated with it, its efficacy is lost on the second day. Experiments on the value of soaking shirting in the remedy were made as follows :—Shallow cardboard boxes 1 inch in diameter and $\frac{3}{8}$ inch deep were lined with flannel shirting which had been washed and dried by the ordinary laundry process and then soaked in a solution of the remedy and dried off rapidly ; the open side of the boxes was covered with chiffon through which the insects fed. These boxes were kept by day in a linen bag suspended beneath the clothing and at night beneath a belt with the chiffon side next the skin, the available feeding period being about seven hours. The remedies tested were sulphur, vermijelli, vermijelli and cresylic acid, vermijelli and naphthaline. The results were almost nil except with vermijelli and naphthaline ; in all other cases, eggs were laid on the flannel as in the control. A second test made with flannel impregnated two days previously, showed that the vermijelli-naphthaline preparation rapidly loses its effectiveness by evaporation. Trials were then made with lice on pieces of flannel soaked in six different solutions and enclosed in pockets of fine chiffon, worn next to the skin. An emulsion of carbolic acid and soft soap was the most effective of these, the practical effect of the impregnation lasting six or seven days while the odour might act as a deterrent for a few days longer. Cytisine appears to be effective experimentally, but its toxic effect might be serious if it is used to impregnate garments ; it is also very costly. These trials suggest that a practical remedy for preventing the spread of lice among troops may be an emulsion consisting of 45–50 per cent. of soft soap combined by heating with 50–55 per cent. crude carbolic acid. Garments should be impregnated with a 5 per cent. solution of this emulsion in warm water and thoroughly dried before use. The cost, apart from labour, is about $\frac{1}{2}$*d.* per shirt.

Robinson (H. W.). **Same species of Tick Infesting Polecat and Otter.** —*Zoologist, London*, no. 904, 16th October 1916, p. 399.

Examples of *Ixodes hexagonus* are recorded in England from polecats kept in captivity and from otters.

Government Notice [concerning House-Flies].—*Extract from Official Gaz., Georgetown*, 6th May 1916, 4 pp. [Received 28th October 1916.]

In British Guiana, *Musca domestica* breeds in horse manure, rotting fruit and vegetables, farinaceous substances, decaying feathers mixed with chicken manure, rotting meat, etc. In the laboratory larvae were reared successfully on damp bran. Under the same conditions at an average temperature of 78·8° F. the incubation period of the egg was 13 hours; this period would be lessened under the higher temperature of natural conditions. The most favourable temperature for larval development lies between 90° and 98° F.; in the laboratory at an average temperature of 84·6° F., the duration of this stage was six days. This, under suitable conditions, may be reduced to four days. The pupal stage lasted five days, giving a total of 12 days for the complete life-cycle. The female is ready to oviposit about six days after emergence, and is capable of producing five or six batches of more than 100 eggs each. Natural enemies of *M. domestica* in British Guiana include two species of mites, and spiders, especially those belonging to the family Attidae, attacking the adults, and ants, fowls and a Hymenopterous parasite, attacking larvae and pupae.

Flies are not extremely abundant in those parts of Georgetown in which a good system of sanitation exists, but are very prevalent in the less sanitary parts. The stables, etc., present in the town and in the vicinity of the harbour are responsible for at least 80 per cent. of the total number of flies. The following measures should therefore be enforced:—(1) All stables should be provided with a concrete floor so that regular flushing can be carried out. (2) Concrete drains connecting with a main drain or trench should be provided. (3) Manure should not be allowed to accumulate in or about stables; closed bins should be provided for the reception of manure and should be emptied at least once a week. In houses, fly-papers or traps baited with molasses should be freely exposed.

Lochhead (W.). **Some notes regarding Nose and other Bot Flies.**—*46th Ann. Rept. Entom. Soc. Ontario, 1915, Toronto*, 1916, pp. 102–108, 5 figs. [Received 10th October 1916.]

The flies which trouble horses so much in the western provinces of Canada have been identified as *Gastrophilus nasalis* (nose fly) from specimens sent from Saskatchewan. For the past two or three years in Chateauguay and Huntingdon counties, certain flies were reported as very troublesome to dairy herds in the pastures during June and early July. These have been identified as *Hypoderma bovis.* The outbreak is due to the large importation into these counties of cattle from Scotland. A table is given for identifying the common genera and species of Oestridae, and the wings of *Gastrophilus nasalis, G. equi, G. haemorrhoidalis, Hypoderma bovis* and *H. lineata* are figured.

HADWEN (S.). **The seasonal prevalence of *Hypoderma bovis* in 1915, together with observations on the terrifying effect *H. bovis* has upon cattle, and lesions produced by the larvae.**—*46th Ann. Rept. Entom. Soc. Ontario, 1915, Toronto,* 1916, pp. 108–119, 4 figs. [Received 10th October 1916.]

At Agassiz, British Columbia, the seasonal activity of *Hypoderma bovis* extended from the beginning of June to the beginning of August, in 1915. The last larvae to emerge from the backs of cattle did so during the first days of July. As an average of all the records of the pupal stage (except Carpenter's record of 8 weeks in 1914) gives 35 days, the season for flies cannot extend far into August. High temperatures shorten the pupal period; when larvae of *H. bovis* were placed in an incubator at 80° F., the flies emerged in from 16 to 19 days. The situation in which the larva finds itself on leaving its host also makes some difference. Crevices in the floors of stables, etc., must be warmer than the outside air. Such situations would mainly favour *H. lineata* and the early larvae of *H. bovis*, and it is quite possible that some of the early appearances of the former may be accounted for in this way. The terror inspired in cattle by *H. bovis* is due to its persistence in attack and the manner in which it oviposits. As it only lays one egg at a time, it is able to do so regardless of the movements of the animal, but the distribution of the eggs is consequently more irregular than in *H. lineata*. Hewitt's observations on the penetration of the skin by the larvae of *H. bovis* [see this *Review*, Ser. B, iii, p. 19] are confirmed. The passage of *H. bovis* larvae was proved by cutting circles in the hair round newly laid eggs, and later, after the eggs had hatched, by finding the swellings underneath. These swellings are somewhat different from those of *H. lineata*, as there is less exudation of serum, and they seem rounder and more raised. They are usually about half an inch in diameter, but if several eggs are laid close together, the swellings may merge into one another. In *H. lineata*, it is probable that several larvae choose the same follicle for entrance, seeing that a number of eggs are attached to the same hair. The eggs nearest the skin hatch first, and it would seem probable that the larvae follow one another through the same opening. The result would be a larger opening than the single larva of *H. bovis* could make, and consequently a bigger flow of serum occurs. The swellings in the case of *H. bovis* are sometimes quite large, but there is not so much dermatitis or exfoliation of the skin. One remarkable fact was noted in regard to both species of larvae: the swellings and skin lesions are confined almost entirely to the older animals, the calves only showing slight effects. This natural immunity breaks down with age and is all the more interesting because young cattle are more heavily parasitised than older individuals.

LEGENDRE (J.). **Destruction des Moustiques par les Poissons.** [Destruction of mosquitos by fish.]—*C.R. Hebdom. Acad. Sci., Paris,* clxiii, no. 15, 9th October 1916, pp. 377–378.

A station has been established at Antananarivo, Madagascar, for the purpose of breeding two varieties of carp which feed on Anopheline larvae and which have been imported from France and from Reunion respectively. Observations on another introduced form, *Carassius* *auratus*, were made in rice-fields and it was found that the high temperature and abundant food-supply, occasioned by the presence of the mosquito larvae, caused a rapid multiplication. In one instance 1,300 fish increased to 18,000 in 5 months.

Pour détruire les moustiques dans les rizières. [The destruction of mosquitos in rice-fields.]—*La Vie Agric. et Rur, Paris*, vi, no. 43, 21st October 1916, p. 312.

This article deals with the same subject-matter as the one abstracted above.

Ferris (G. F.). **Anoplura from Sea-Lions of the Pacific Ocean.**—*Entom. News, Philadelphia*, xxvii, no. 8, October 1916, pp. 366–370, 1 fig.

This paper records *Antarctophthirius microchir*, Troues. & Neum., from *Zalophus californianus* (Californian sea-lion) and *Echinophthirius fluctus*, sp. n, from a skin of what is probably a young *Eumetopias jubata* (Stellar sea-lion).

Cleland (J. B.), Bradley (B.) & McDonald (W.). **On the Transmission of Australian Dengue by the Mosquito** *Stegomyia fasciata*.—*Med. Jl. Australia, Sydney*, ii, nos. 10–11, 2nd & 9th September 1916, pp. 179–184 & 200–205, 1 coloured plate.

The extension of the epidemic of dengue from Queensland to some of the North Coast towns of New South Wales early in 1916 has led to an investigation of the aetiology of this disease, and the results of certain experiments are published in this preliminary paper, showing that *Stegomyia fasciata* (yellow fever mosquito) transmits it. Previous work bearing on the experimental production of dengue fever by mosquitos is reviewed, including that by Graham, Bancroft and Ashburn and Craig. The first series of experiments by the present authors are not described in detail here, as negative results were obtained. In the second series, mosquitos were collected in Mullumbimby and the surrounding district, about 100 *S. fasciata* and 112 *Culex fatigans* being obtained. Occasional examples of *Culex annulirostris* were found in Mullumbimby, but, except in one instance, they were not used in the experiments. A summary of these is given, taking the nine persons volunteering *seriatim*, with a detailed history of the four successful cases. The authors' conclusions are as follows:—(1) *Stegomyia fasciata* caught in a dengue-infected district, some of which were known to have fed on a dengue patient on the first and second day of his illness, when transported to a non-dengue district, reproduced the desease in four out of seven persons on whom experiments were conducted. (2) Blood taken from three of these four cases reproduced the disease when injected into other persons; the blood in the fourth case was not tested. (3) The incubation period of the four cases was found to be possibly between 5 and 9½ days, probably between 6½ and 9½ days, reckoning from the bite to the definite onset of the disease. (4) No known case of contagion occurred from any of the above four cases. (5) No evidence was obtained from two cases, one of which was heavily and repeatedly bitten with *Culex fatigans*, that this mosquito is capable of acting as a transmitter of dengue fever.

NOTICES.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Director.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent direct to the Assistant Director, Imperial Bureau of Entomology, 89, Queen's Gate, London, S.W., or through any bookseller.

CONTENTS.

PAGE.

Trypanosoma triatomae, a New Flagellate found in *Triatoma protracta* in California 181
Traps and Baits for House-flies 181
Fleas infesting Rats in New South Wales 181
The Mosquitos of Sydney 182
Notes on Australian Tabanids 182
Notes on Tabanids and other Flies from Queensland 183
Insect Enemies (Review) 183
Structure of the Mouth-parts of the Body-louse 183
The Bionomics and Control of *Psoroptes communis* var. *ovis* on Sheep in South Africa 184
Experiments with *Psoroptes communis* in South Africa 186
The Chemistry of Sulphur Sheep Dips 187
Trials with Sheep Dips in South Africa 189
An Arsenical Dip-Tester 189
The Transmission of *Haemoproteus columbae* by *Lynchia capensis* in South Africa 189
The Use of Castor Oil against Bed-bugs in Russia 190
The Anti-malaria Campaign of 1914 in Algeria 190
Mosquitos and Malaria in Algeria 190
Methods of destroying Bed-bugs 191
Ordinance against Breeding of Mosquitos in Texas 191
Ticks infesting Cattle in Guam 191
A Poison Spray for Flies 191
Ticks and Disease in Egypt 192
Arsenical Dip for Cattle in Egypt 192
Experiments in the Control of Lice 192
Ixodes hexagonus infesting Polecat and Otter in England 194
The Control of House-flies in British Guiana 194
Notes on Oestrids infesting Cattle in Canada 194
The Seasonal Prevalence of *Hypoderma bovis* in Canada 195
The Use of Fish against Mosquito Larvae in Madagascar .. 195–196
Anoplura from Sea-Lions of the Pacific Ocean 196
Transmission of Dengue Fever by *Stegomyia fasciata* in Australia .. 196

VOL. IV. Ser. B. Title-page and Index. [Issued Aug., 1917.]

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES B: MEDICAL AND VETERINARY.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

Smithsonian Institution
SEP 17 1917
National Museum.

LONDON:
SOLD BY
THE IMPERIAL BUREAU OF ENTOMOLOGY,
89, QUEEN'S GATE, S.W. 7.
1916.
Price 1/6d. net.

All Rights Reserved.

IMPERIAL BUREAU OF ENTOMOLOGY.

Honorary Committee of Management.

VISCOUNT HARCOURT, *Chairman.*

Lieutenant-Colonel A. W. Alcock, C.I.E., F.R.S., London School of Tropical Medicine.
Mr. E. E. Austen, Entomological Department, British Museum (Natural History).
Dr. A. G. Bagshawe, C.M.G., Director, Tropical Diseases Bureau.
Mr. E. C. Blech, C.M.G., Foreign Office.
Sir J. Rose Bradford, K.C.M.G., F.R.S., Secretary, Royal Society.
Surgeon-General Sir David Bruce, C.B., F.R.S., A.M.S.
Mr. J. C. F. Fryer, Entomologist to the Board of Agriculture and Fisheries.
Dr. S. F. Harmer, F.R.S., Keeper of Zoology, British Museum (Natural History).
Professor H. Maxwell Lefroy, Imperial College of Science and Technology.
The Hon. Sir John McCall, M.D., Agent-General for Tasmania.
Dr. R. Stewart MacDougall, Lecturer on Agricultural Entomology, Edinburgh University.
Sir John McFadyean, Principal, Royal Veterinary College, Camden Town.
Sir Patrick Manson, G.C.M.G., F.R.S., Late Medical Adviser to the Colonial Office.
Sir Daniel Morris, K.C.M.G., Late Adviser to the Colonial Office in Tropical Agriculture.
Professor R. Newstead, F.R.S., Dutton Memorial Professor of Medical Entomology, Liverpool University.
Professor G. H. F. Nuttall, F.R.S., Quick Professor of Protozoology, Cambridge.
Professor E. B. Poulton, F.R.S., Hope Professor of Zoology, Oxford.
Lieutenant-Colonel Sir David Prain, C.I.E., C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew.
Mr. H. J. Read, C.B., C.M.G., Colonial Office.
The Honourable N. C. Rothschild.
Mr. Hugh Scott, Curator in Entomology, Museum of Zoology, Cambridge.
Dr. A. E. Shipley, F.R.S., Master of Christ's College, Cambridge.
Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture.
Mr. F. V. Theobald, Vice-Principal, South Eastern Agricultural College, Wye.
Mr. C. Warburton, Zoologist to the Royal Agricultural Society of England.

The Chief Entomologist in each of the Self-governing Dominions is an *ex officio* member of the Committee.

General Secretary.

Mr. A. C. C. Parkinson (Colonial Office).

Director and Editor.

Dr. Guy A. K. Marshall.

Assistant Director.

Mr. S. A. Neave.

Head Office.—British Museum (Natural History), Cromwell Road, London, S.W. 7.
Publication Office.—89, Queen's Gate, London, S.W. 7.

INDEX OF AUTHORS.

A reference in heavy type indicates that a paper by the author has been abstracted.

Alessandrini, G., **83**.
Alvares, M. G. de A., **48**.
Annandale, N., **118**.
Ashworth, J. H., **87**.
Atkinson, E. L., **91**.
Awati, P. R., **74**, **172**.

Bacot, A. W., **57**, **161**, **192**.
Balfour, A., **142**, **150**, **179**.
Banks, N., **96**.
Barber, L. B., **191**.
Barret, H. P., **61**, **136**.
Basile, C., **102**.
Beal, W. P., **12**.
Bedford, G. A. H., **186**, **189**.
Bequaert, J., **16**, **22**, 31, **40**, **138**.
Bergevin, E. de, **139**.
Bertarelli, E., **153**.
Bertolio, S., **152**.
Bevan, Ll. E. W., **46**.
Beyer, H. G., **135**.
Bezzi, M., **156**.
Bishopp, F. C., **1**, **4**, **34**, **181**.
Bishop, W. A., **105**.
Blanc, G., **63**, **121**.
Blanchard, 17.
Böing, **58**.
Bouet, G., 21, **84**, **101**.
Bouilliez, M., **84**.
Boyce, Sir Rubert, 12.
Bradley, B., **196**.
Brauer, 22, 24, 78, 88.
Brumpt, E., 38, 103.
Brunetti, E., 52.
Buchanan, R. M., **45**.
Buckland, J., **2**.
Burton-Brown, G., **141**.
Buttrick, P. L., **95**.

Calderon, H., **69**.
Canalis, P., **94**.
Carini, A., **59**.
Carpano, M., **14**, 69.
Carpenter, G. H., 195.
Carter, H. F., **109**.
Carter, H. R., **109**, **180**.
Castellani, A., **7**.
Chagas, Dr., 59.
Chand, K., **124**.
Chandler, W. L., 119.
Chapin, R. M., **3**.
Chatton, E., **63**, **121**.
Chidester, F. E., **123**.
Christophers, S. R., **23**, **24**, **74**, **124**, **172**.
Chubb, E. C., **121**.
Chun, J. W. H., **101**.
Clare, H. L., **69**.
Cleland, J. B., **110**, 149, **181**, **196**.
Coghill, H. S., **66**.
Connal, A., **66**.
Cooper, H., **192**.
Copeman, Lieut.-Col. S. M., **141**.
Cornwall, J. W., **124**, **174**.
Corlette, C. E., **135**.
Costa Lima, A. da, **39**, **61**, **137**, **177**.
Cotton, E. C., **2**.
Cousins, H. H., **160**.
Coutant, A. F., **78**.
Crawley, H., **64**.
Creel, R. H., **25**, **76**, **86**, **155**, **175**.
Crosse, W., **148**.
Cumpston, J. H. L., **59**.
Cunha, A., **83**.
Curlewis, A. W., **179**.

d'Anfreville, L., **16**, **40**, 85.
Da Costa, B. F. B., **48**.
Da Costa Lima, A., **39**, **61**, **137**, **177**.
Da Silva, P., 15, **49**.

(C366) Wt. P1/131. 1,500. 8.17. B &F.Ltd. G.11/2. A

Dalziel, J. M., **149, 150.**
De Bergevin, E., **139.**
De Raadt, O. L. E., **127, 128, 130.**
De la Rivière, R. D., **17.**
De Vogel, W. T., **130.**
Derivaux, R. C., **137.**
Descazeaux, J., **165.**
Dible, J. H., **20.**
Diguet, L., **9.**
Dollman, H. C., **122.**
Donovan, 102.
Dos Santos, A. C., **48.**
Du Buysson, **138.**
Duckett, A. B., **96.**
Dufour, 138.
Dyar, H. C., **159, 160.**

Ealand, C. A., **183.**
Edwards, F. W., **64,** 112, **120.**
Eltringham, H., **108.**
Engelhardt, V. M., **50.**
Evans, A. T., **147.**
Ezdorf, R. H. von, **77.**

Faget, F. M., **155.**
Fantham, H. B., **43,** 103.
Felt, E. P., **170.**
Ferguson, E. W., 11, **41, 181, 182.**
Ferris, G. F., **120, 176, 196.**
Filippini, A., **104.**
Foley, H., **134.**
Fowler, Sir J. K., **150.**
Franchini, 103.
Fricks, L. D., **77.**
Friedmann, A., **83.**
Froggatt, J. L., **70.**
Froggatt, W. W., **179.**
Fry, Major A. B., 118.
Fuschini, C., **14.**

Galaine, C., **156.**
Gapin, Dr., 102.
Garden, G., **19, 170.**
Gaskell, Major T. K., **121.**
Gaulke, 35.
Gerlache, 184.
Gill, C. A., **172.**
Girault, A. A., **122.**
Given, Staff-Surg. D. H. C., **131.**
Goldsmid, J. A., **148.**
Gonder, R., **189.**
Graham-Smith, G. S., **143.**
Green, H. H., **187, 189.**
Griffiths, T. H. D., **160.**
Grimshaw, P. H., **102.**
Grixoni, G., **153.**

Hadwen, S., **195.**
Halberkann, J., **61.**
Hall, M. C., **58, 63.**
Harrison, L., **183.**
Hase, A., **35.**
Hay, G. G., **154.**
Headlee, T. H., **6.**
Hegh, E., **36.**
Héraud, A., **191.**
Herms, W. B., **119, 176.**
Herrick, G. W., **12.**
Hewitt, C. G., **80, 122,** 195.
Heymann, B., **87.**
Higgins, J. T. D. S., **57.**
Hill, G. F., **8, 72.**
Hirschberg, 53.
Hirst, S., **68, 86, 141, 159.**
Hoepke, 41.
Holborow, A. G., **46.**
Holt, J. J. H., **140,** 141.
Houbert, C., **156.**
Houssiau, J., **15.**
Howarth, E., **140.**
Howlett, F. M., **32, 91,** 141.
Hutchison, R. H., **62.**

Illingworth, J. F., 41.
Imes, M., **148.**
Ingram, A., **111.**
Izar, Capt., 154.

Jackson, T. W., **7.**
Jepson, F. P., **41.**
Jobbins-Pomeroy, A. W., **81.**
Johnson, W. B., **149, 150.**
Johnston, J. E. L., **112.**
Jojot, C., **110.**
Jordan, K., **32, 33.**
Joyeux, C., **21.**

Kaupp, B. F., **53.**
Kellogg, V. L., **120, 137.**
Kemp, S., **118.**
Kennan, R. H., **45.**
Keyworth, W. D., **124.**

King, H. H., 22.
King, W. V., **53, 90,** 136, **152.**
Kingon, J. R. L., **105.**
Kinloch, J. P., 57, **133.**
Kirsch, 78.
Kitano, T., **154.**
Knab, F., **30, 107, 160, 175.**
Knese, **126.**
Kofoid, C. A., **181.**
Korke, V. T., **125.**
Koselkine, P. M., **101.**
Kuhn, 58.
Kulagin, N. M., 50.

La Frenais, M. H., **124.**
Laake, E. W., **1.**
Lahille, F., **177.**
Lamborn, W. A., **28, 113.**
Lamson, jnr., G. H., **26.**
Landois, 41.
Lane, Lieut.-Col. D. T., **86.**
Langeron, M., **156.**
Laveran, A., **9, 85, 102, 103.**
Legendre, J., **49, 195.**
Leishman, Sir W. B., **150.**
Lemaire, 103.
Lenz, 135.
Leonard, T. M. R., **149.**
Le Prince, J. A., **97.**
Levy, 180.
Lheritier, 103.
Lima, A. Da Costa, **39, 61, 137, 177.**
Liston, Major W. G., **75.**
Lloyd, Ll., **44,** 102, **117.**
Lochhead, W., **194.**
Lodge, O. C., **168.**
Loir, Dr., 53.
Lutje, **2.**
Lutz, A., **36, 37, 137.**

MacBean Ross, J. N., **143.**
MacDougall, R. S., **178.**
Macfarlane, H., **39.**
Macfarlane, R. M., **130.**
Macfie, J. W. S., **27, 42, 81, 111.**
MacGregor, M. E., **116, 131.**
Machado, A., 36, 38.
Malloch, J. R., **55, 107.**
Mally, C. W., **80.**
Marchoux, E., **85.**
Marett, P. J., **20.**
Mariana, A., **152.**
Martini, E., **16.**
Mason, C., **171.**
Mason, F. E., **7, 192.**
Mayer, M., **134.**
Mayr, L., **158.**
Mazzuoli, S., **62.**
McCaffrey, D., **154.**
McCarthy, T., 179.
McCulloch, Irene, **181.**
McDonald, W., **196.**
McEachran, J. F., **8.**
Messore, L., **19.**
Michie, H. C., **76.**
Miessner, H., **126.**
Mitter, J. L., **24, 75.**
Mitzmain, M. B., **76, 92, 136, 175.**
Moniz, G., **134.**
Moore, H. W. B., 177.
Moore, W., **79.**
Morales, R., **177.**
Morison, J., **124.**
Morris, Staff-Surg. L. M., **59.**
Musselius, A. A., **50.**
Muto, A., 83, **177.**

Neiva, A., **137.**
Nicolle, C., 103.
Nobbs, E. A., **171.**
Nocht, B., **134.**
Noel, P., **53.**
Nuttall, G. H. F., **34, 55, 64.**

O'Brien, J. M., **149.**
Orenstein, A. J., **97, 104.**
Orme, Dr. W. B., 73.

Paoli, G., **70.**
Parker, R. R., **78, 147.**
Parsons, H. H., **76.**
Patterson, R., **123.**
Patton, Capt. W. S., 49, 102.
Peacock, A. D., **133.**
Pirussky, V. S., 25.
Pomeroy, A. W. Jobbins, **81.**
Portchinsky, I. A., **51, 88.**
Porter, A., **43,** 103.
Prashad, B., **74.**
Pregl, 135.
Price, 103.
Prince, J. A. le, **97.**
Raadt, O. L. E. de, **127, 128, 130.**
Ragazzi, C., **69.**

Randone, F., **60**.
Rankin, Major A. C., **139**.
Ransom, B. H., **63**.
Rène, C., **70**, **158**.
Ricardo, G., **65**.
Richardson, C. H., **5**, **106**.
Richter, H. G., 18, 179.
Rivière, R. D. de la, **17**.
Roberg, D. N., **51**.
Roberts, N., **94**.
Robertson, G. E., **94**.
Robinson, L. E., **34**.
Robinson, H. W., **194**.
Rodhain, J., **15**, **16**, **22**, **40**, **56**, **67**, **101**, **138**.
Rogers, 103.
Roper, R., 73.
Ross, J. N. MacBean, **143**.
Ross, P. H., **167**.
Ross, Sir R., **150**.
Ross, T. S., **92**.
Ross, W. A., **91**.
Rothschild, Hon. N. C., **32**, **33**.
Roubaud, E., 15, 21, **22**, **39**, 43, **101**, **102**, 138.
Rovere, 21.

Sá, C., **83**.
Sant'Anna, J. F., **48**.
Saunders, W. H., **167**, **168**.
Schmidt, M., **158**.
Schokhor, N. J., **101**.
Schøyen, T. H., **180**.
Schuberg, **58**.
Schüffner, W., **52**.
Schumann, P., **126**.
Schwetz, J., **30**, **31**, **43**.
Scott, J. W., **14**.
Seidelin, H., **12**.
Sen, S. K., 177.
Sergent, E., 103, **139**.
Sergent, Edmond, **93**, **134**, **190**.
Sergent, Etienne, **93**, **190**.
Shilston, A. W., **184**.
Shircore, J. O., **54**, **130**.
Siler, J. F., **90**.
Silva, P. da, 15, **49**.
Simpson, W. J., **150**.
Sinclair, J. M., **73**, **108**, **151**, **171**.
Sitanala, J. B., **127**.
Skriabin, J. K., **24**.
Stanton, A. T., **23**.
Stedefeder, **10**.
Stephens, 43.
Storey, G., **86**.
Strickland, C., **54**, **66**.
Strong, 65.
Sturgess, G. W., **123**.
Sweet, G., **70**.
Swellengrebel, N. H., **127**, 128, 130.
Swenk, M. H., **169**.

Taylor, F. H., **10**, **30**, **91**, 135, **183**.
Theiler, Sir A., **27**.
Thompson, W. A., 11.
Torres, M., **37**.
Townsend, G. H., **63**, **65**, **96**, **122**, **123**, **159**.
Tuck, 180.
Turner, R. E., **116**.

Van den Branden, F., **101**.
Vécsei, F., **61**.
Velu, **164**.
Vialette, C., **156**.
Villeneuve, J., **16**, **125**, **126**.
Vishniakov, Th. A., **51**.
Vogel, W. T. de, **130**.
von Ezdorf, R. H., **77**.

Wagner, J., **151**.
Warburton, C., **34**.
Washburn, F. L., **152**.
Waterston, J., **65**, **121**, **166**.
Weidman, F. D., **40**.
Wenton, **49**.
Whitfield, A., **46**.
Widmann, E., **87**.
Williams, F. H., 111.
Wohlfart, **88**.
Wolbach, S. B., **154**.
Wolfel, K., **47**.
Wood, J. Y., **44**.
Wurth, Dr., 129.
Wyler, E. J., **148**.

Yakimoff, W. L., **101**.

GENERAL INDEX.

In the case of scientific names the page reference is cited only under the heading of the generic name.

When a generic name is printed in brackets it signifies that the name is not adopted.

A.

abdominalis, Culex (Culicelsa).
abfitchi, Ochlerotatus (Aëdes).
abruptus, Thyridanthrax.
Abyssinia, mosquitos in, **120.**
Acacia cyclopis, branches of, for carrying baits for house-flies, **80.**
Acanthaspis sulcipes, probably not a carrier of endemic goitre in Africa, **139.**
Acanthia lectularius (see *Cimex*).
Acanthocera, in Brazil, **37.**
Acarina, of North America, **96.**
acasta, Melittobia.
acer, Chrysoconops (see *Taeniorhynchus brevicellulus*).
aconitus, Anopheles.
acutus, Ceratophyllus.
Adalia obliterata, in houses in Britain, **102.**
adelpha, Leptopsylla.
Adhesives, formulae for, for trapping flies, **20, 53, 181.**
Aëdes, **37.**
Aëdes abfitchi (see *Ochlerotatus*).
Aëdes aurifer (see *Ochlerotatus*).
Aëdes calopus (see *Stegomyia fasciata*).
Aëdes canadensis (see *Ochlerotatus*).
Aëdes cantator (see *Ochlerotatus*).
Aëdes funerea, in Northern Australia, **11.**
Aëdes impiger (see *Ochlerotatus*).
Aëdes ornatus (see *Ochlerotatus*).
Aëdes sollicitans (see *Ochlerotatus*).
Aëdes squamiger, breeding-places of, in California, **159.**
Aëdes subcantans (see *Ochlerotatus*).
Aëdes sylvestris (see *Ochlerotatus*).
Aëdes taeniorhynchus (see *Ochlerotatus*).
Aëdes triseriatus (see *Ochlerotatus*).
Aëdes trivittatus (see *Ochlerotatus*).
Aëdes (Skusea) uniformis, in Northern Australia, **10, 11.**
Aëdimorphus australis, in Queensland, **60.**
Aëdomyia squamipennis, in Brazil, **37.**
Aëdomyia venustipes, in Queensland, **60.**
aegyptium, Hyalomma.
aequisetosa, Xenopsylla.
affinis, Micropus.
Africa, new Anthomyiids from, **125**; canine piroplasmosis conveyed by *Haemaphysalis leachi* in, **34**; *Cordylobia anthropophaga* on dogs in, **58**; control of malaria in, **154**; new mites from, **142**; bionomics of flies causing myiasis in, **138**; tick-borne diseases in, **64, 119.**
Africa, East, *Dermatophilus penetrans* in, **5**; distribution of *Glossina morsitans* in, **47**; house-flies and parasitic worms in, **54**; *Ixodes nairobiensis*, sp. n., from, **55**; mosquitos in, **120**; *Paederus crebripunctatus* causing dermatitis in, **167**; insect-borne diseases in, **130**; *Passeromyia heterochaeta* in, **138**; *Simulium dentulosum*, sp. n., from, **39.**
Africa, French West, bionomics of *Choeromyia* spp. in, **101**; insect-borne diseases in, **84.**
Africa, North, *Onchocerca gutturosa* infesting *Bos taurus* in, **70.**
Africa, South, loss due to African coast fever in, **105**; new Anoplura from, **120**; new Calliphorine flies from, **126**; formula for cattle-dips used in, **107**; investigations of horse-sickness in, **27**; bionomics and control of house-flies in, **80**; mosquitos in

120; bionomics and control of sheep-scab in, **184–189**.
Africa, West, dermatitis in, **15**, **167**; new mosquitos from, **64**; bionomics of mosquito larvae in, **111**; *Stegomyia fasciata* and yellow fever in, **150**, **165**; (see under Nigeria, Sierra Leone, etc.).
African Coast Fever, loss due to, in S. Africa, **105**; ticks conveying, in the Belgian Congo, **64**; disease resembling, in Egypt, **7**; in cattle in Libya, **69**; and its control in Rhodesia, **73**, **107**, **151**, **171**.
africana, Stegomyia.
africanus, Mansonioides; *Pharyngobolus.*
agilis, Laelaps.
ahalae, Pygiopsylla.
aitkeni, Anopheles.
akamushi, Microtrombidium.
albertensis, Ceratophyllus ignotus.
albescens, Uranotaenia.
albibasis, Johannsenomyia.
albimanus, Anopheles.
albimedius, Tabanus.
albipalpus, Tabanus.
albipennis, Olfersia.
albipictus, Dermacentor.
albirostris, Anopheles.
alboabdominalis, Uranotaenia.
alboannulatus, Ochlerotatus (*Culicelsa*).
albocephalus, Ochlerotatus.
albolineata, Polietes.
albotaeniatus, Anopheles.
Alcohol, effect of, on larvae of *Wohlfartia magnifica*, **89**.
Alcimus rubiginosus, attacking *Chrysops woodi* in Nyasaland, **171**.
alcocki, Silvius.
Algeria, goitre probably not carried by blood-sucking Rhynchota in, **139**; leishmaniasis carried by *Phlebotomus* in, **103**; drainage measures against mosquito larvae in, **93**; mosquitos and malaria in, **190**.
Allactaga elater, *Mesopsylla lenis* on, in Turkestan, **32**.
Aloes, in cattle dips, **73**.
Alphitobius, in swallow's nest in the Gold Coast, **81**.
alternans, Mucidus.
Alum, use of, against fleas in China, **5**.
Alysia manducator, parasite of house-flies in Britain, **146**.
amazonicum, Simulium.
ambiqua, Pseudornithomyia.
Amblyomma, on dogs in Sierra Leone, **150**.
Amblyomma americanum, in Canada, **80**.
Amblyomma cayennense, probable carrier of piroplasmosis of dogs in Brazil, **59**.
Amblyomma eburneum, in Italian Somaliland, **70**.
Amblyomma hebraeum, carrying heart-water in domestic animals, **64**; not found in Italian Somaliland, **70**.
Amblyomma lepidum, in Italian Somaliland, **70**.
Amblyomma marmoreum, hosts of, in the Gold Coast, **81**; in Italian Somaliland, **70**; in Sierra Leone, **45**.
Amblyomma splendidum, in Sierra Leone, **45**.
Amblyomma striatum, probable carrier of piroplasmosis of dogs in Brazil, **59**.
Amblyomma triguttatum, in N. Australia, **11**.
Amblyomma variegatum, attacking man and animals in French Guinea, **21**; probably transmitting *Piroplasma* in the Gold Coast, **42**; in Nigeria, **66**, **113**; on cattle in Rhodesia, **108**; in Sierra Leone, **45**; not found in Italian Somaliland, **70**.
America, Acarina of, **96**.
America, Central, *Dermatobia hominis* in, **58**; new fleas from, **33**.
America, North, new Anoplura from, **176**; European flies established in, **107**; new fleas from, **33**; (see Canada and United States).
America, South, *Dermatobia hominis* in, **58**; *Dermatophilus penetrans* in, **5**; new fleas from, **33**; Hippoboscids infesting birds in, **137**; ticks from, **55**.
americana, Blatta; *Graphomyia*; *Olfersia.*
americanum, Amblyomma.
Ammonia, use of, against lice, **135**, **154**.
Ammonium Carbonate, experiments with, as a bait for flies, **106**.
Ammonium Hydroxide, experiments with, as a bait for flies, **106**.
Ammonium Nitrate, in baits for house-flies, **169**.
ampelophila, Drosophila.
Amphipsylla certa, probably a variety of *A. shelkovnikovi*, **151**.
Amphipsylla contigua locuples, hosts of, in Turkestan, **32**.
Amphipsylla dumalis, sp. n., hosts of, in Turkestan, **32**.
Amphipsylla primaris, sp. n., on *Mustela erminea* in Turkestan, **32**.

Amphipsylla shelkovnikovi, on *Microtus* in Caucasia, 151.
Anas superciliosa, *Ixodes anatis* on, in New Zealand, 55.
Anastatus viridiceps, parasite of *Glossina morsitans* in Northern Rhodesia, 117.
Anastellorhina augur (*Calliphora oceaniae*), bionomics and control of, in Australia, 71, 122, 179, 183.
anatis, *Ixodes*.
Andamans, mosquitos and malaria in, 54.
angulatus, *Linognathus*.
angustatus, *Ixodes*.
angustifrons, *Olfersia*.
anhydor, *Uranotaenia*.
anips, *Culex*.
Aniseed, Oil of, against lice, 153.
Anisocheleomyia nivipes (see *Uranotaenia*).
Anisol, against lice, 17.
anisus, *Ceratophyllus*.
Ankylostoma duodenale, and houseflies in British East Africa, 54.
annetti, *Taeniorhynchus*.
annulata, *Uranotaenia*.
annulatum, *Piroplasma*.
annulatus, *Culex* (*Leucomyia*); *Margaropus* (*Boophilus*); *Ochlerotatus* (*Culicada*).
annuliferus, *Mansonioides*.
annulioris, *Culex*.
annulipes, *Anopheles* (*Nyssorhynchus*); *Mansonioides*; *Ochlerotatus* (*Culicada*).
annulirostris, *Culex*; *Culicelsa* (see *Culex sitiens*); *Ochlerotatus*.
anomalus, *Hoplopsyllus*.
Anomiopsyllus nudatus, hosts of, in Arizona, 33.
Anopheles, and malaria, 19, 44, 53, 54, 59, 69, 73, 74, 76, 77, 84, 85, 86, 90, 92, 97, 104, 124, 127, 130, 131, 136, 139, 154, 172, 175, 190; in Africa, 154; in North Borneo, 73; in India, 54, 74, 85, 86; in Jamaica, 90; effect of clearing on distribution of, in Malay States, 67; in Mesopotamia, 172; not carrying malaria in Minnesota, 152; in Morocco, 85; list of, in Panama, 97; in the Punjab, 86; in Salonica, 179; of Sumatra, 23; in U.S.A., 61, 76, 77, 152, 180; breeding-places of, 19, 61, 69, 118, 173; classification of, 24, 73, 74; key to larvae of Malayan species of, 24; screening measures against, 99; natural enemies of, 137; experimentally infecting rats with *Crithidia fasciculata*, 103; pilotaxy of, 23.
Anopheles aconitus, in Sumatra, 23.
Anopheles aitkeni, in India, 124; not known to attack man, 67.
Anopheles albimanus, in Brazil, 37; transmitting malaria in Jamaica, 90; in Panama, 97, 98; and malaria, 104.
Anopheles albirostris, in Malay States, 67.
Anopheles albotaeniatus, and malaria in North Borneo, 73; in Sumatra, 23.
Anopheles annulipes, and malaria, 104; bionomics and distribution of, in Australia, 11, 60, 73, 182, 183.
Anopheles apicimacula, in Panama, 97.
Anopheles agyrotarsis, and malaria, 104; in Brazil, 37; transmitting malaria in Jamaica, 90; in Panama, 97.
Anopheles atratipes, in New South Wales, 182.
Anopheles bancrofti (see *A. barbirostris* var.).
Anopheles barbirostris, and malaria, 104; in Northern Australia, 8; and malaria in North Borneo, 73; in New Guinea, 127; and malaria in India, 74, 124; in Sumatra, 23.
Anopheles barbirostris var. *bancrofti*, in Australia, 11, 60, 183.
Anopheles barianensis (see *A. plumbeus*).
Anopheles bifurcatus, and malaria, 104; in France, 139.
Anopheles brevipalpus, sp. n., and malaria in North Borneo, 73.
Anopheles cinereus, breeding-places of, in Muscat, 173.
Anopheles costalis, and malaria in Tropical West Africa, 21, 44, 45, 49, 66, 81, 104, 112, 150, 161, 165.
Anopheles crucians, transmitting malaria in Jamaica, 90; and malaria in U.S.A., 76, 92, 136, 152; seasonal distribution of, in U.S.A., 180.
Anopheles cruzi, in Panama, 97.
Anopheles culicifacies, relation of, to malaria in India, 74; breeding-places of, in Muscat, 173.
Anopheles culiciformis, breeding-places of, in India, 124.
Anopheles domicolus, sp. n., from Northern Nigeria, 64.
Anopheles eiseni, in Panama, 97.
Anopheles elegans, in India, 124.
Anopheles formosaensis, and malaria, 104.
Anopheles fowleri, breeding-places of, in India, 118.

Anopheles franciscanus, in Panama, 97.
Anopheles fuliginosus, relation of, to malaria, 74, 104; breeding-places of, in India, 74, 118; in Malay States, 67; in Sumatra, 23.
Anopheles funestus, and malaria in Tropical West Africa, 21, 44, 45, 84, 104, 150, 161.
Anopheles funestus var. *arabica*, breeding-places of, in Muscat, 173.
Anopheles funestus var. *listoni*, relation of, to malaria in India, 74.
Anopheles gigas, in India, 124.
Anopheles gorgasi, in Panama, 97.
Anopheles grabhami, in Jamaica, 90.
Anopheles hispaniola (see *A. turkhudi*).
Anopheles jamesi, in India, 124.
Anopheles jeyporiensis, in India, 124.
Anopheles karwari, in Malay States, 67.
Anopheles kochi, and malaria in North Borneo, 73; in Malay States, 67; in Sumatra, 23.
Anopheles leucosphyrus, and malaria in North Borneo, 73; in India, 124; in Sumatra, 23.
Anopheles lindesayi, in India, 124.
Anopheles listoni, and malaria, 104; breeding-places of, in India, 118.
Anopheles ludlowi, and malaria in North Borneo, 73; relation of, to malaria in India, 74; absent from Chilka Lake, in India, 118; and malaria in Malay States, 54; breeding-places of, in Sumatra, 23, 130.
Anopheles lukisi, sp. n., from Mesopotamia, 172.
Anopheles maculatus, and malaria in North Borneo, 73; relation of, to malaria in India, 74, 124; and malaria in Malay States, 67; in Sumatra, 23.
Anopheles maculipalpis and malaria, 104; relation of, to malaria in India, 74, 124.
Anopheles maculipennis, on ships in Mexico, 59; in Morocco, 85; captured in Paris, 101; conveying malaria, 104.
Anopheles malefactor, in Panama, 97, 98.
Anopheles mauritianus, not known to be a carrier of malaria in Africa, 120; in Nigeria, 66.
Anopheles minimus, relation of, to malaria in India, 74.
Anopheles myzomyifacies (see *A. turkhudi*).
Anopheles nigerrimus (see *A. sinensis*).
Anopheles nigripes, breeding-places of, in Germany, 16.
Anopheles occidentalis, breeding-places of, in California, 160.
Anopheles pharoensis, and malaria, 104.
Anopheles plumbeus, bionomics of, in India, 74.
Anopheles pseudopunctipennis, breeding-places of, in California, 160; in Panama, 97, 98; and malaria, 104.
Anopheles punctimacula, in Panama, 97.
Anopheles punctipennis, bionomics and control of, in U.S.A., 61, 77, 136, 160, 170, 180; relation of, to malaria in U.S.A., 53, 90, 92, 76, 136, 152, 175; not transmitting subtertian malaria in U.S.A., 76; a carrier of *Plasmodium vivax* but not of *P. falciparum*, 136.
Anopheles punctulatus, and malaria in North Borneo, 73.
Anopheles quadrimaculatus, bionomics and control of, in U.S.A., 77, 180; conveying malaria in U.S.A., 76, 136, 152.
Anopheles rhodesiensis, breeding-places of, in Muscat, 173; a possible carrier of malaria in Sierra Leone, 44, 45.
Anopheles rossi, relation of, to malaria in India, 74; breeding-places of, in India, 118, 124; in Malay States, 54, 67; breeding places of, in Sumatra, 130.
Anopheles rossi var. *indefinitus*, in Sumatra, 23.
Anopheles rossi var. *vagus*, in India, 124.
Anopheles schüffneri, in Sumatra, 23.
Anopheles separatus, and malaria in North Borneo, 73.
Anopheles sinensis, and malaria, 104; breeding-places of, in India, 118; in Malay States, 54, 67; in Sumatra, 23.
Anopheles sinensis var. *mesopotamiae*, in Mesopotamia, 172.
Anopheles stephensi, relation of, to malaria in India, 74; breeding-places of, in Muscat, 173; failure to infect with leishmaniasis, 103; and malaria, 104.
Anopheles superpictus, and malaria, 104.
Anopheles tarsimaculatus, in Panama, 97, 98; and malaria, 104.
Anopheles tessellatus, in India, 124; and malaria in Malay States, 54; in Sumatra, 23.

Anopheles theobaldi, and malaria, 74, 104.
Anopheles turkhudi, relation of, to malaria in India, 74, 104; habits of, in Algeria, 190.
Anopheles umbrosus, in West Africa, 45, 66; and malaria in Malay States and Borneo, 54, 67, 73, 104; in Sumatra, 23.
Anopheles vestitipennis, in Jamaica, 90.
Anopheles willmori, relation of, to malaria in India, 74, 154.
Anophelines (see *Anopheles*).
Anoplura, new species of, from South Africa, 120; new species of, from North America, 176; infesting sea-lions in the Pacific, 196.
ano-rufa, *Pyrellia*.
anseris, *Lipeurus*.
Antarctophthirius microchir, on *Zalophus californianus*, 196.
Antelopes (see Game).
antennatus, *Neohaematopinus*.
Anthomyia pluvialis, in houses in Britain, 144.
Anthomyia radicum, bionomics of, in Britain, 143.
Anthrax, Tabanidae conveying, in China, 101; transmitted by *Stomoxys calcitrans*, 58.
anthropophaga, *Cordylobia*.
Antimony Oxychloride, in baits for house-flies, 169.
antiquorum, *Doratopsylla*.
Ants, attacking bed-bugs, 174; said to control *Musca domestica* in Northern Australia, 73; predaceous on house-flies in Fiji, 41; destroying mosquitos in Sierra Leone, 163.
apachinus, *Ceratophyllus ignotus*.
Apaicha, probably carried by Tabanidae in Peru, 63.
Aphaereta cephalotes, parasite of house-flies in Britain, 146.
Aphiochaeta ferruginea, relation of, to disease, 51.
Aphiochaeta rufipes, in houses in Britain, 102, 121.
Aphodius spp., *Gongylonema scutatum* found in, 63.
apicimacula, *Anopheles*.
apicoannulatus, *Ochlerotatus*.
apicoargentata, *Stegomyia*.
Apodemus tscherga, fleas on, in Turkestan, 32.
Apodemus hebridensis, mites on, in Britain, 141, 142.
Apodemus sylvaticus, mites on, in Britain, 141, 142.
Aponomma exornatum, in Italian Somaliland, 70.
Aponomma laeve, on snakes in the Gold Coast, 81; in Sierra Leone, 45.
appendiculatus, *Rhipicephalus*.
Apteryx mantelli, *Ixodes anatis* on, in New Zealand, 55.
Archaeopsylla erinacei, on *Erinaceus* in Caucasia, 151.
Ardea, a new *Olfersia* on, in Brazil, 137.
ardua, *Coptopsylla*.
Argas persicus, in Chile and Argentina, 177; in Italian Somaliland, 70; transmitting spirochaetosis in fowls, 101, 192; experiments with plague in fowls and, 62.
Argas persicus var. *porteri*, in Chile, 177.
argenteopunctatus, *Ochlerotatus*.
argenteoventralis, *Armigeres*.
Argentina, *Argas persicus* in, 177.
argentipes, *Phlebotomus*.
argyrocephala, *Lucilia*.
argyrotarsis, *Anopheles*.
Arizona, new fleas in, 33.
Armadillo, a reservoir of *Trypanosoma cruzi* in Brazil, 39.
armata, *Fannia*.
Armigeres argenteoventralis, distribution of, in Africa, 120.
Armigeres jugraensis, in Sumatra, 23.
armipes, *Hydrotaea*.
arribalzagae, *Taeniorhynchus*.
Arsenic, tolerance of cockroaches for, 140; as a rat-poison to control plague, 155; in dips for protecting sheep from blow-flies, 71.
Arsenical Dips, for cattle, 73, 107, 160, 192; formulae for, 107; oxidation of, 3, 46; tester for, 189.
Arsenious Acid, in formula for lice on horses, 178; in formula for dip against mange, 165.
Arthrolytus, parasite of household insects, 121.
Arvicanthis dorsalis, a new *Hoplopleura* on, in Zululand, 120.
Arvicola amphibius, mites on, in Britain, 142.
Arvicola terrestris, *Laelaps agilis* on, in Britain, 142.
Arvicola terrestris scythicus, fleas on, in Turkestan, 32.
Ascaris lumbricoides, ova of, found in house-flies in British East Africa, 54.
Ashanti, mosquitos in, 120.
Asia, Central, *Wohlfartia* spp. in, 89.
Asia Minor, ticks in, 55.
Asilidae, attacking Tabanids in Nyasaland, 171.

asini, Haematopinus.
Asphaltum, Oil of, against mosquito larvae, **98.**
Assam, transmission of leishmaniasis in, **103.**
assimilis, Muscina.
astia, Xenopsylla.
Astrachan, *Paederus fuscipes* in, **51.**
aterrima, Phora.
Atoxyl, value of, against spirochaetosis in fowls, **81.**
atra, Conicera.
atratipes, Anopheles (*Pyretophorus*).
atripes, Mimeteomyia ; *Stegomyia.*
Atyphloceras echis, gen. et sp. n., on *Mus* in Arizona, **33.**
Auchmeromyia luteola, in Eritrea, **156** ; in French Guinea, **22** ; in Senegal, **102.**
augur, Anastellorhina.
Aulacephala, **22.**
aulacodi, Scipio.
aulicus, Dermacentor reticulatus.
auratus, Carassius.
aureus, Taeniorhynchus.
aurifer, Ochlerotatus (*Aëdes*).
auriflua, Diatomineura.
aurifrons, Sarcophaga.
aurites, Taeniorhynchus (*Chrysoconops*).
auritulus, Ixodes.
austeni, Glossina.
Australia, value of birds in destroying sheep parasites in, **110** ; a new Chalcid parasite of *Anastellorhina augur* in, **179** ; relation of *Stegomyia fasciata* to dengue in, **149, 196** ; sheep maggot flies in, **70, 122, 179, 183** ; legislation against introduction of *Hypoderma bovis* into, **73** ; new blood-sucking Leptids from, **41** ; mites on fowls in, **159** ; mosquitos of, **60, 72, 90, 182, 183, 196** ; new Muscid flies from, **122, 159** ; *Onchocerca gibsoni* on cattle in, **8** ; dips for protecting sheep from blow-flies in, **70–72** ; Tabanids from, **182, 183** ; ticks in, **55** ; possibility of introduction of yellow fever into, **59, 135.**
australis, Aëdimorphus ; *Demoplatus* ; *Eumusca* ; *Margaropus* (*Boophilus*) ; *Neomacleaya* ; *Ochlerotatus* (*Culex*) ; *Silvius.*
Austria, measures against lice in, **153.**
Austrophasia, generic name proposed for *Hyalomyia rufiventris*, **159.**
autumnale, Microtrombidium.
autumnalis, Musca.
avicularia, Ornithomyia.
Azelaria macquarti, bionomics of, in houses in Britain, **144, 145.**
azurea, Phormia (*Protocalliphora*).

B.

Babesiasis, in domestic animals in West Africa, **42.**
bacilliforme, Piroplasma (see *Theileria parva*).
bacilliformis, Bartonella.
baculus, Lipeurus.
Bacillus coli, fruit infected with, by flies and wasps, **145.**
Bacillus paratyphosus, **52.**
Bacillus typhosus, **52.**
Badger, *Pulex irritans* on, in Europe, **4.**
Baits, for house-flies, **14, 20, 92, 106, 107, 142, 144, 145, 167, 168, 169, 181.**
balassogloi, Wohlfartia.
Balsam of Peru, against lice, **153.**
Bamboos, mosquitos breeding in, in Trinidad, **69.**
Bananas, a bait for house-flies, **167** ; cultivation of, associated with malaria, **90.**
bancrofti, Anopheles (*Myzorhynchus*) (see *A. barbirostris* var.).
Bancroftia signifer (see *Orthopodomyia*).
Banksinella lineatopennis, distribution of, **120.**
Banksinella luteolateralis, in Natal, **120** ; in Principe, **49.**
Banksinella luteolateralis var. *flavinervis*, in Natal, **120.**
Banksinella punctocostalis, in Nigeria, **66.**
barbirostris, Anopheles (*Myzorhynchus*).
barianensis, Anopheles (see *A. plumbeus*).
Barbus, destroying mosquito larvae in Sierra Leone, **44.**
Bartonella bacilliformis, causing verruga, in Peru, **65, 123.**
basalis, Pseudoskusea.
Bats, destroying mosquitos, **99.**
Bdellolarynx sanguinolentus, life history of, in India, **75.**
Bed-bugs (*Cimex lectularius*), in Canada, **22** ; in India, **91, 124** ; in Norway, **180** ; in Salonica, **179** ; destruction of, on ships, **94** ; experiments with kala-azar and, **124, 174** ; probably incapable of transmitting *Leishmania* spp. **175** ; probably not carriers of leishmaniasis in Peru, **63** ; measures against, **8, 190, 191** ; natural enemies of, **174** ; effect

of temperature on, 91; fumigation with hydrocyanic acid against, 86, 94, 135, 155.
beecheyi, Citellus (*Otospermophilus*).
Beer, in baits for house-flies, 181.
bellus, Neoceratopogon (*Ceratopogon*).
Bembex, predaceous on Tabanids in Nyasaland, 171.
benefactrix, Mutilla.
Benzine against lice, 17, 104, 154.
Benzol, against lice, 104, 193.
bequaerti, Pyrellia.
berberum, Trypanosoma.
bertrandi, Oestrus.
besti, Tabanus.
bevisi, Ochlerotatus.
bezzianum, Pycnosoma (*Chrysomyia*).
bicolor, Pegomyia.
bifurcatus, Anopheles.
bigeminum, Piroplasma.
biguttatus, Culicoides; *Tabanus.*
bilineata, Uranotaenia.
billingtoni, Tabanus.
bimaculatus, Diachlorus.
Birch Tar, ingredient of formula against lice, 50, 51.
Birds, *Glossina morsitans* on, in Rhodesia, 118; *Haemaphysalis leporis-palustris* on, in Canada, 80; induced herpetomoniasis in, 43; Hippoboscids infesting, in N. and S. America, 137, 169; ticks on, 55; destroying mosquitos, 99; value of, in destroying sheep parasites in Australia, 110; importance of, in, destroying ticks in Jamaica, 2; nestling, attacked by *Passeromyia heterochaeta* in Africa, 16.
bisselliella, Tineola.
biseriatum, Menopon.
bisetis, Megarthroglossus.
Biskra Boil, transmission of, 9.
bitaeniorhynchus, Culex.
blanchardi, Kirkioestrus.
blarinae, Doratopsylla.
Blatta americana, imported into Norway from the Mediterranean, 180.
Blatta germanica (see *Phyllodromia*).
Blatta orientalis, methods of detroying, 140.
Blepharoptera serrata, bionomics of, in Britain, 143.
Blow-flies, dips for protecting sheep from, in Australia, 70–72; experiments, in the control of, 167–169.
Boar, Wild, *Dermacentor reticulatus* var. *aulicus* on, in France, 86.
Bombay, percentage of *Xenopsylla* spp. on rats in, 75.
Boophilus (see *Margaropus*).
Borax, against house-fly larvae, 5, 93, 141.
borealis, Silvius.
Boric Acid, for protecting domestic animals from flies, 158; effect of, on larvae of *Wohlfartia magnifica*, 89.
Borneo, mosquitos and malaria in, 54, 73.
Bos gaurus, probably original host of *Onchocerca*, 70.
Bos indicus, infested with *Onchocerca* spp. in India and Malay States, 70.
Bos taurus, infested wich *Onchocerca gutturosa* in Northern Africa, 70.
botaurinorum, Olfersia.
boueti, Choeromyia; *Leptocimex* (*Cimex*).
bovis, Hypoderma; *Psoroptes communis*; *Sarcoptes scabiei.*
Brachycoma devia, in houses in Britain, 144.
bracteum, Simulium.
brandoni, Glossina (see *G. austeni*).
brasiliensis, Xenopsylla.
Brazil, Hippoboscids infesting birds in, 137; epidemiology of Chagas' disease in, 37–39; bionomics of *Dermatobia hominis* in, 157; *Hunterellus hookeri* in, 39; mosquitos and other blood-sucking Diptera from, 36; *Paederus columbinus* causing dermatitis in, 15, 51; Tabanidae of, 37; tick-borne diseases of cattle in, 69, 83.
brehmei, Culex.
brevibranchium, Simulium.
brevicellulus, Taeniorhynchus.
breviceps, Scipio.
brevicornis, Nasonia.
brevipalpis, Glossina; *Toxorhynchites.*
brevipalpus, Anopheles.
brevirostris, Diatomineura.
brevivitta, Tabanus.
Britain, list of fleas in, 166; bionomics of house-flies in, 87, 102, 108, 121, 143–147, 167–169; measures against importation of *Hypoderma bovis* from, into Australia, 73; mites and ticks in, 141, 194; *Phormia azurea* in, 78; insects infesting man and animals, in, 68, 88, 178.
British Columbia, fleas in, 33; bionomics of *Hypoderma bovis* in, 195.
British Guiana, bionomics and control of *Musca domestica* in, 194; a new *Simulium* in, 30; *Taeniorhynchus titillans* in, 177.
Bromine, against cockroaches, 140.
brucei, Trypanosoma.

Bubalis lelwel jacksoni, *Lyperosia* spp. feeding on, 68.
Bubo maximus (Eagle Owl), *Dermanyssus gallinae* on, in Britain, 142.
Buffalo, *Margaropus caudatus* on, in Guam, 191; worm-nodules in, 70; not infested with *Onchocerca gibsoni*, 8.
Buffalo Gnats (see *Simulium*).
bullata, *Sarcophaga*.
bullifrons, *Haematopota*.
Burma, *Ixodes granulatus* in, 55.
bursa, *Liponyssus*.
Bushbuck, Hippoboscids on, in Nyasaland, 171.
buteonis, *Ornithomyia*.

C.

cadaverina, *Cynomyia*; *Pyrellia*.
caerulea, *Paratricyclea*.
caeruleocephala, *Rachionotomyia*.
caesar, *Lucilia*.
Calandra, parasitised by *Cerocephala*, 121.
calcarata, *Haemaphysalis*.
calcitrans, *Stomoxys*.
caledonicus, *Ixodes*.
California, new fleas in, 33; mosquitos of, 159; bionomics of *Ornithodorus coriaceus* in, 118.
Californian Ground Squirrel (see *Citellus beecheyi*).
californicus, *Perognathus*.
caliginosa, *Chaetoneurophora*.
caliginosus, *Ochlerotatus*.
calligraphus, *Chironomus*.
Calliphora, traps for, in Egypt, 142.
Calliphora erythrocephala, bionomics of, in Britain, 102, 143; in Gallipoli, 92; in Salonica, 179; on the battlefield, 17; in relation to disease, 46; experiments in the control of, 5, 167, 169.
Calliphora flavipes, in Queensland, 183.
Calliphora groenlandica (see *Protocalliphora*).
Calliphora occaniae (see *Anastellorhina augur*).
Calliphora rufifacies (see *Pycnosoma*).
Calliphora varipes (see *Pycnosoma*).
Calliphora villosa (see *Pollenia stygia*).
Calliphora vomitoria, bionomics of, in Britain, 143, 145; in Gallipoli, 92; in relation to disease, 46; experiments with baits for, 169.
calliphorae, *Chalcis*.
Callistopsyllus terinus, sp. n., in America, 33.
Calomel, ineffective against lice, 25.
Calomyia priestleyi, in Queensland, 60.
calopus, *Stegomyia* (*Aëdes*) (see *S. fasciata*).
camelina, *Hippobosca*.
Camels, ticks on, in Egypt, 192; trypanosomiasis of, in Eritrea, 156; *Hyalomma aegyptium* on, in Libya, 15; insect-borne diseases of, in the Sahara, 157.
Camphor, Spirits of, against bites of *Simulium*, 158.
Canada, control of *Cimex lectularius* in, 91; new fleas from, 33; measures against importation of *Hypoderma bovis* from, into Australia, 73; Oestrids infesting domestic animals in, 194, 195; list of ticks from, 55, 80; proposed entomological investigations in, 122.
canadensis, *Ochlerotatus* (*Aëdes*).
Canary Islands, *Culex tipuliformis* in, 120; mules from, partly immune to trypanosomiasis in the Gold Coast, 42.
cancroides, *Chelifer*.
canescens, *Tephrochlamys*.
canicularis, *Fannia*.
canium, *Dipylidium*.
Canis latrans, *Megarthroglossus sicamus* on, in British Columbia, 33.
canis, *Ctenocephalus*.
canis, *Piroplasma*.
cantator, *Ochlerotatus* (*Aëdes*).
Cantharis flavicornis, causing dermatitis in Senegal, 15.
Cantharis vestita, causing dermatitis in Senegal, 15.
Cape Colony, *Haemolaelaps capensis* sp. n., on *Georychus hottentotus* in, 142.
capensis, *Haemolaelaps*; *Lynchia* (*Olfersia*); *Rhipicephalus*.
capitis, *Pediculus*.
Capra hircus, ticks on, in Asia Minor, 55.
caprae, *Psoroptes communis*; *Trypanosoma*.
Carassius auratus, imported into Madagascar against mosquito larvae, 195.
Carbolic Acid, emulsion of, effective against lice, 193; against mites, 53; effect of, on animal parasites, 79; effect of, on larvae of *Wohlfartia magnifica*, 89; ingredient of mosquito larvicide, 98; in dips for protecting sheep from blow-flies, 71.
Carbon Bisulphide, against *Gastrophilus equi* in horses, 62; for destroying lice, 83.

carnaria, Sarcophaga.

Carolina, North, list of mosquitos from, **136**.

Carp, imported into Madagascar against mosquito larvae, **195**.

carpophagus, Geophilus.

casei, Piophila.

Casein, in baits for house-flies, **107**, **169**.

castellanii, Tyroglyphus longior.

Castor Oil, recommended against bed-bugs, **190**; for making fly-papers, **181**; and resin as an adhesive, **20**.

Cat Flea (see *Ctenocephalus felis*).

Catallagia charlottensis, on *Peromyscus macrochirus* in British Columbia, **33**.

Catallagia decipiens, sp. n., hosts of, in British Columbia, **33**.

Cathartes aura (Golden-headed Vulture), a new *Olfersia* on, in Brazil, **138**.

Cats, *Cordylobia anthropophaga* on, in the Gold Coast, **81**; control of fleas on, **35**; *Ixodes pratti* on, in Canada, **80**; effect of nitrobenzine on, **79**.

Cattle, losses of, in S. Africa due to African coast fever, **105**; importation of, into Australia prohibited at certain seasons, **73**; insect-borne diseases in, in the Belgian Congo, **64**, **67**, **68**; tick-borne diseases of, in Brazil, **69**, **83**; *Piroplasma divergens* in, in Britain, **34**; ticks and other pests of, in Canada, **80**, **122**, **194**; attacked by *Haematopota singalensis* in Ceylon, **123**; tick-borne diseases in, in Egypt, **192**; trypanosomiasis of, in Eritrea, **156**; killed by *Simulium reptans* in Germany, **126**; trypanosomiasis and other diseases of, in the Gold Coast, **42**; *Margaropus caudatus* on, in Guam, **191**; insects attacking, in French Guinea, **21**; killed by *Simulium* in Hungary, **158**; mosquitos attacking, in India, **91**; African coast fever in, in Libya, **14**, **69**; Tabanids on, in New South Wales, **182**; insect-borne diseases of, in Nigeria, **112**; Simuliidae attacking, in Nyasaland, **171**; trypanosomiasis in, in Nyasaland, **18**, **19**; insect-borne diseases in, in Rhodesia, **46**, **73**, **108**, **151**; compulsory dipping of, in Rhodesia, **171**; insects attacking, in U.S.A., **81**, **107**; treatment of mange on, **178**; flies causing myiasis in, **2**, **88**; distribution of *Onchocerca* spp. in, **8**, **70**; relation of, to *Ornithodorus coriaceus*, **120**; not attacked by *Psoroptes communis* var. *cuniculi*, **187**; dips for, against tick-borne diseases, **3**, **46**, **73**, **107**, **160**, **192**.

Caucasia, list of fleas from, **151**.

caucurtei, Ixodiphagus.

caudatus, Margaropus.

cayennense, Amblyomma.

cazalboui, Trypanosoma.

Cellia (see *Anopheles*).

Centrochalcis exaratum (see *Stomatoceras*).

cephalotes, Aphaereta.

Cephalomyia maculator (see *Cephalopsis titillator*).

Cephalophus dorsalis, *Trypanosoma ingens* in the blood of, **67**.

Cephalophus natalensis, *Linognathus angulatus* on, in S. Africa, **120**.

Cephalopsis titillator, synonymy of, **22**.

Cephenomyia, **22**.

Ceratophyllus acutus, and plague, **4**.

Ceratophyllus anisus, and plague, **4**.

Ceratophyllus columbae, on owls in Caucasia, **151**.

Ceratophyllus elatus, sp. n., hosts of, in Turkestan, **32**.

Ceratophyllus fasciatus, in Britain, **166**; and plague, **4**; on rats in New South Wales, **182**; infecting rats with *Herpetomonas pattoni*, **103**.

Ceratophyllus fidus, sp. n., on *Apodemus tscherga* in Turkestan, **32**.

Ceratophyllus gallinae, in Britain, **166**; on turkeys in U.S.A., **13**.

Ceratophyllus ignotus, in U.S.A., **33**.

Ceratophyllus ignotus albertensis, subsp. n., hosts of, in Canada, **33**.

Ceratophyllus ignotus apachinus, on *Thomomys talpoides agrestis* in Colorado, **33**.

Ceratophyllus ignotus franciscanus, hosts and distribution of, **33**.

Ceratophyllus ignotus recula, subsp. n., hosts of, in Br. Columbia, **33**.

Ceratophyllus macrophthalmus, sp. n., on *Arvicola terrestris scythicus*, in Turkestan, **32**.

Ceratophyllus praefectus, sp. n., on *Apodemus tscherga* in Turkestan, **32**.

Ceratophyllus tersus, sp. n., on *Rhombomys opimus* in Turkestan, **32**.

Ceratopogon bellus (see *Neoceratopogon*).

Ceratopogon fusicornis (see *Euforcipomyia*).

Ceratopogon peregrinus, in Illinois, **55**.

Cercopithecus mona, in Principe, **48.**
Cercopithecus schmidti, parasites in the lungs of, **41.**
Cerocephala, parasite of *Calandra*, **121.**
certa, Amphipsylla.
Cervicapra fulvorufula, Linognathus fahrenholzi on, in S. Africa, **121.**
Ceylon, parasitic worms in cattle in, **70**; insect-borne diseases in, **123.**
Chaetoneurophora caliginosa, **51.**
Chaetoneurophora curvinervis, **51.**
Chagas' Disease, epidemiology of, in Brazil, **37–39.**
Chalcis calliphorae, sp. n., parasite of *Anastellorhina augur* in Australia, **179.**
chameleon, Stratiomyia.
Chaoborus indicus, in Sumatra, **23.**
charlottensis, Catallagia.
Chelifer cancroides, in Norway, **180.**
Chelifer nodosus, infesting houseflies in Britain, **146.**
Chelifer scorpioides, infesting *Stomoxys calcitrans* in Britain, **146.**
cheopis, Xenopsylla.
Cheyletus, attacking man in Sumatra, **52.**
Chigger (see *Dermatophilus penetrans*).
Chile, Argasid ticks in, **177.**
China, Tabanidae conveying anthrax in, **101**; use of alum against fleas in, **5**; *Ixodes japonensis* in, **55**; mosquitos and malaria in, **131**; *Passeromyia heterochaeta* in, **138.**
Chironomus calligraphus, in Guatemala, **177.**
Chloroform, against *Chrysomyia macellaria*, **105.**
Chloroform Water, effect of, on larvae of *Wohlfartia magnifica*, **89.**
Choeromyia boueti, bionomics of, in Senegal, **101.**
Choeromyia choerophaga, bionomics of, in Senegal, **101.**
choerophaga, Choeromyia.
Cholera, relation of *Aphiochaeta ferruginea* to, **51**; relation of *Simulium* to, in fowls and pigs, **82.**
chordeilis, Haemaphysalis.
Chorioptes equi, causing mange in horses, **178.**
Chortophila cilicrura, bred from manure heaps in England, **108.**
Chortophila fugax, in houses in Britain, **144.**
chrysidiformis, Cobboldia.
Chrysoconops acer (see *Taeniorhynchus brevicellulus*).
Chrysoconops aurites (see *Taeniorhynchus*).
Chrysomyia bezziana (see *Pycnosoma*).
Chrysomyia macellaria (Screw-worm Fly), **122**; infesting dogs, **58**; not likely to be spread by man, **96**; causing myiasis in Panama, **105**; in U.S.A., **1.**
Chrysomyza demandata, bred from manure heaps in England, **108.**
chrysophila, Corizoneura.
Chrysops dispar, in Hong Kong, **65.**
Chrysops distinctipennis, in the Belgian Congo, **68.**
Chrysops funebris, in the Belgian Congo, **68.**
Chrysops laetus, in Brazil, **36.**
Chrysops longicornis, in Nigeria, **66.**
Chrysops mlokosiewiczi, in Hong Kong, **65.**
Chrysops molestus, in Brazil, **36.**
Chrysops silacea, in the Belgian Congo, **68.**
Chrysops striatus (see *C. mlokosiewiczi*).
Chrysops woodi, attacked by *Alcimus rubiginosus* in Nyasaland, **171.**
chrysostigma, Orthetrum.
Chrysozona (see *Haematopota*).
chubbi, Taeniorhynchus.
ciliata, Psorophora.
cilicrura, Chortophila.
Cimex boueti (see *Leptocimex*).
Cimex hemiptera, relation of, to leishmaniasis, **102, 125, 174**; (see also Bed-bugs).
Cimex lectularius (see Bed-bugs).
Cimex rotundatus (see *C. hemiptera*).
cinerea, Nepa.
cinerescens, Tabanus.
cinereus, Anopheles.
cingulatus, Culex.
cinnabarina, Haemaphysalis.
Cinnyris cupreus, attacked by *Passeromyia heterochaeta* in Africa, **16.**
circumdatus, Tabanus.
Citellus (Otospermophilus) beecheyi, (Californian Ground Squirrel), *Ceratophyllus ignotus franciscanus* on, in U.S.A., **33**; and plague, **176**; parasites in the lungs of, **41.**
Citellus douglasi, and plague in U.S.A., **176.**
Citronella, Oil of, against cockroaches, **140.**
Civet Cat, *Phalacropsylla paradisea* on, in Arizona, **33.**
clavata, Pangonia.
Clayton Gas, fumigation of ships with, **94.**
clelandi, Spaniopsis.
Cobboldia chrysidiformis, parasite of African elephant, **40.**

Cobboldia elephantis, parasite of Indian elephant, **40**.
Cobboldia loxodontis, parasite of African elephant, **40**.
Cobus defassa, *Lyperosia* spp. on, **68**; parasites resembling *Theileria mutans* in, **68**.
Cochliomyia, new generic name proposed for *Chrysomyia macellaria*, **122**.
Cockroaches, not attacking bedbugs in India, **174**; in Norway, **180**; methods of destroying, **94**, **140**, **141**, **155**.
Cod-liver Oil, against flies, **34**.
Coelodiazesis (see *Anopheles*).
Coenocephalus concolor, breeding-places of, in New South Wales, **182**.
Coenotele gregalis, nest of, used as a fly-trap in Mexico, **9**.
Coffee, distribution of rats in plantations of, in Java, **128**.
cognata, *Onesia*.
coleoptratorum, *Gamasus*.
Colombia, *Simulium sanguineum*, sp. n., attacking man in, **30**.
Colorado, *Ceratophyllus ignotus apachinus* on *Thomomys talpoides agrestis* in, **33**.
Columba livia, *Dermanyssus gallinae* in nests of, in Britain, **142**.
columbae, *Ceratophyllus*; *Haemoproteus*.
columbiae, *Psorophora*.
columbinus, *Paederus*.
comitans, *Neotabanus*.
comitatus, *Culex*.
Common Hen Louse (see *Menopon pallidum*).
communis, *Psoroptes*; *Ravinia*.
compar, *Goniocotes*.
concinna, *Haemaphysalis*.
concolor, *Coenocephalus*; *Culex*.
confluens, *Ornithoica*.
Congo, Belgian, new Anthomyiids from, **125**; new Calliphorine flies from, **126**; parasites in the lungs of *Cercopithecus schmidti* in, **41**; dermatitis caused by a Staphylinid beetle in, **15**; bionomics and distribution of *Glossina* spp. in, **30**, **31**, **36**, **43**, **56**, **67**; mosquitos in, **120**; flies causing myiasis in, **138**; Oestrids of, **22**, **44**; ticks and tick-borne diseases in, **63**; trypanosomiasis and piroplasmosis in, **67**.
congoiensis, *Tabanus*.
congolense, *Trypanosoma*.
Conicera atra, **51**.
conopas, *Taeniorhynchus*.
Conorhinus (see *Triatoma*).
consimilis, *Culex*.
consors, *Paratricyclea*.
conspurcatum, *Trinoton*.
contigua locuples, *Amphipsylla*.
convictrix, *Poecilochroa*.
cookei, *Ixodes hexagonus*.
Copra Itch, caused by *Tyroglyphus longior* var. *castellanii*, **46**.
Copper Sulphate, in dips for protecting sheep from blow-flies, **71**.
Coptopsylla ardua, sp. n., on *Rhombomys opimus* in Turkestan, **32**.
cordiformitarsus, *Culicoides*.
Cordylobia anthropophaga, distribution of, in Africa, **138**; infesting dogs in Africa, **58**; in the Gold Coast, **81**; in French Guinea, **22**; in Senegal, **102**; erroneously recorded as *Choeromyia choerophaga*, **16**.
Cordylobia rodhaini, distribution and bionomics of, in Africa, **138**.
coriaceus, *Ornithodorus*.
Corizoneura chrysophila, in New South Wales, **182**.
cornicina, *Pseudopyrellia*.
corporis, *Pediculus* (see *P. humanus*).
Corrosive Sublimate, ingredient of ointment against lice, **25**; effect of, on larvae of *Wohlfartia magnifica*, **89**; (see also Mercury Perchloride).
Corticaria nidicola, living in nest of *Coenotele gregalis*, **9**.
corvina, *Musca* (see *M. autumnalis*).
Corvus corax, *Ixodes caledonicus* on, in Britain, **142**.
Corvus cornix, *Ixodes caledonicus* on, in Britain, **142**.
Corvus frugilegus, infested with *Gastrophilus inermis* in Turkestan, **24**.
Costa Rica, *Ixodes auritulus* in, **55**.
costalis, *Anopheles* (*Pyretophorus*).
costaricensis, *Ornithomyia*.
Cotocripus pusillus, in Brazil, **36**.
Cotocripus stylifer, in Brazil, **36**.
crassus, *Tabanus*.
crebripunctatus, *Paederus*.
Creolin, use of, against lice, **83**; against lice on horses, **178**; apparatus for fumigation with, **178**; fumigation with, against mosquitos, **134**; against larvae of *Wohlfartia magnifica*, **89**.
Creosote, ineffective against bedbugs, **86**; against cockroaches, **140**; against fleas on domestic animals, **35**; against lice, **133**; against poultry mites, **166**.
Cresol, against lice in Russia, **13**.
Cresyl, for protecting domestic animals from flies, **158**; against lice, **17**; in formula for dip against mange, **165**.

Cresylic Acid, against lice, **193**; retarding oxidation of arsenical dips, **3**.

Crete, *Culex tipuliformis* in, **120**.

Cricetomys, *Cordylobia rodhaini* on, in Africa, **139**.

Cricetomys gambianus (Giant-Pouched Rat), parasites of, in the Gold Coast, **81**.

Cricetulus fulvus, fleas on, in Turkestan, **32**.

Crithidia fasciculata, transmitted to rats by *Anopheles*, **103**.

Crithidia melophagi, transmitted to rats by *Melophagus ovinus*, **103**.

Crithidia simuliae, parasite of *Simulium*, **82**.

croceus, *Tabanus biguttatus*.

Crocidura ilensis, fleas on, in Turkestan, **32**.

Crows, economic value of, in Australia, **110**; destroying larvae of house-flies, **92**.

crucians, *Anopheles*.

cruzi, *Anopheles*; *Trypanosoma*.

Cryptoplasma rhipicephali, recorded in error as a parasite of *Rhipicephalus sanguineus*, **63**, **121**.

Cryptotylus unicolor, in Brazil, **36**.

ctenocephali, *Herpetomonas*.

Ctenocephalus canis (Dog Flea), in Britain, **166**; on *Vulpes alpherakyi* in Caucasia, **151**; on dogs in Sierra Leone, **150**; control of, in U.S.A., **34**; a carrier of *Dipylidium caninum*, **58**; experimental transmission of flagellates of, **103**; relation of, to leishmaniasis, **49**, **103**; and plague, **4**.

Ctenocephalus serraticeps (see *C. canis*).

Ctenocephalus erinaeei (see *Archaeopsylla*).

Ctenocephalus felis, in Britain, **166**; on rats in New South Wales, **182**; on lynx in Persia, **151**; parasitised by *Nosema pulicis*, sp. n., **125**; and plague, **4**.

Ctenodactylus gundi, *Rhipicephalus sanguineus* on, in Tunis, **63**.

Ctenophthalmus dux, sp. n., hosts of, in Turkestan, **32**.

Ctenophthalmus inornatus, sp. n., on *Prometheomys schlaposchnikovi* in Caucasia, **151**.

Ctenophthalmus spalacis, on *Spalax microphthalmus* in Caucasia, **151**.

Ctenopsylla musculi, on rats in New South Wales, **181**.

Cuba, history of control of mosquitos in, **97–99**.

Culex, in Guatemala, **177**; on ships in Mexico, **59**; in Salonica, **179**; larvae of, destroyed by *Fundulus gardneri* in Sierra Leone, **44**; breeding-places of, in Sumatra, **130**; methods of transporting larvae of, **49**.

Culex abdominalis, in Queensland, **60**.

Culex albovirgatus, in Nigeria, **66**.

Culex anips, sp. n., breeding-places of, in California, **159**.

Culex annulatus, in Queensland, **60**.

Culex annulatus var. *marocanus*, n., in Morocco, **85**.

Culex annulioris, in Nigeria, **66**, **112**.

Culex annulirostris, experiments with dengue and, in Australia, **196**; in Queensland, **60**.

Culex australis (see *Ochlerotatus*).

Culex bitaeniorhynchus, in Sumatra, **23**.

Culex brehmei, sp. n., bionomics of, in New Jersey, **175**.

Culex cingulatus, incapable of biting, **37**.

Culex comitatus, breeding-places of, in California, **159**.

Culex concolor, in Queensland, **60**.

Culex consimilis, breeding-places of, in West Africa, **112**; in Nigeria, **66**; in Sierra Leone, **45**, **150**.

Culex decens, breeding-places of, in West Africa, **28**, **44**, **66**, **81**, **112**, **150**, **165**.

Culex derivator, **159**.

Culex duttoni, breeding places of, in West Africa, **21**, **45**, **66**, **112**, **150**, **165**.

Culex dyari, in U.S.A., **170**.

Culex erythrothorax, breeding-places of, in California, **159**.

Culex fatigans, in Africa, **28**, **66**, **81**, **112**, **120**; bionomics and distribution of, in Australia, **11**, **60**, **72**, **182**, **196**; breeding in ships in Brazil, **37**; breeding-places of, in North Carolina, **61**, **136**; in Fiji, **41**; in Hong Kong, **39**; not transmitting filariasis in Jamaica, **90**; in Morocco, **85**; in Sumatra, **23**; breeding-places of, in Trinidad, **69**; anatomy of, **74**; probably not a carrier of dengue, **196**; failure to infect, with leishmaniasis, **103**.

Culex frenchi, in New South Wales, **11**, **182**.

Culex fuscus, in Queensland, **60**.

Culex gelidus, attacking cattle in India, **91**.

Culex geniculatus, larva of, described, **156**.

Culex grahami, in Nigeria, **66**.

Culex guiarti, in Nigeria, **66**.

Culex halifaxi, in Sumatra, **23**.

Culex ingrami, sp. n., from Ashanti, **64**; breeding-places of, **112**.

Culex insignis, breeding-places of, in West Africa, **66, 112, 120.**
Culex invidiosus, in Nigeria, **66.**
Culex jepsoni, in Fiji, **41.**
Culex mossmani sp. n., in Queensland, **11.**
Culex nilgiricus, sp. n., from Madras, **64.**
Culex nocturnus, in Fiji, **41.**
Culex normanensis, sp. n., in Queensland, **11.**
Culex occidentalis (see *Ochlerotatus*).
Culex pacificus, sp. n., from New Hebrides, **64.**
Culex pallidocephalus, in Natal, **120.**
Culex paludis (see *Ochlerotatus*).
Culex pilosus, in North Carolina, **136.**
Culex pipiens, breeding-places of, in West Africa, **165**; breeding underground in Britain, **131**; in Natal, **120**; breeding-places of, in U.S.A., **7, 95, 170**; infested with *Herpetomonas culicis*, **44**; oiling against larvae of, **95.**
Culex pruina, breeding-places of, in West Africa, **112.**
Culex quasigelidus, in Nigeria, **66.**
Culex quinquefasciatus (see *C. fatigans*).
Culex restuans, breeding-places of, in U.S.A., **61, 136, 170.**
Culex rima, in Nigeria, **66.**
Culex saliburiensis, in Nigeria, **66.**
Culex sagax (see *Ochlerotatus*).
Culex salinarius, breeding in salt marshes in U.S.A., **7**; larva of, described, **156.**
Culex simplex, in Queensland, **60.**
Culex simpsoni, distribution of, in Africa, **120.**
Culex sitiens, in Australia, **11, 60, 73, 182, 183.**
Culex squamosus, in Queensland, **60.**
Culex stigmatosoma, breeding-places of, in California, **159.**
Culex tarsalis, **159.**
Culex territans, **156**; breeding-places of, in U.S.A., **16, 136, 159, 170.**
Culex thalassius, distribution of, in Africa, **120**; in Nigeria, **66.**
Culex tigripes, **60**; in West Africa, **45, 66, 81, 112, 150**; in Australia, **11, 182**; larvae of, predaceous on other mosquito larvae, **120.**
Culex tipuliformis, distribution of, **120.**
Culex tritaeniorhynchus, in Sumatra, **23.**
Culex univittatus, in Natal and Spain, **120**; in Nigeria, **66.**
Culex vishnui, in Sumatra, **23.**
Culicada (see *Ochlerotatus*).
Culicada fergusoni, in New South Wales, **182.**
Culicada inornata, in New South Wales, **182.**
Culicada victoriensis, in New South Wales, **182.**
Culicelsa abdominalis (see *Culex*).
Culicelsa alboannulatus (see *Ochlerotatus*).
Culicelsa annulirostris (see *Culex sitiens*).
Culicelsa paludis (see *Ochlerotatus*).
Culicelsa vigilax (see *Ochlerotatus*).
culicifacies, *Anopheles*.
culiciformis, *Anopheles* (*Coelodiazesis*).
Culiciomyia freetownensis, breeding-places of, in Sierra Leone, **150.**
Culiciomyia nebulosa, in West Africa, **21, 45, 49, 66, 112, 150, 161**; in Natal, **120.**
culicis, *Herpetomonas*; *Lancasteria*.
Culicoides, in Sierra Leone, **150.**
Culicoides biguttatus, in Illinois, **55.**
Culicoides cordiformitarsus, sp. n., in Egypt, **109.**
Culicoides debilipalpis, in Brazil, **36.**
Culicoides guttatus, in Brazil, **36.**
Culicoides guttipennis, in Illinois, **55.**
Culicoides haematopotus, in Illinois, **55.**
Culicoides milnei, in Principe, **49.**
Culicoides paraensis, in Brazil, **36.**
Culicoides peregrinus, breeding-places of, in India, **118.**
Culicoides sanguisugus, in Illinois, **55.**
Culicoides stellifer, attacking man in Illinois, **55.**
Culicoides stephensi, sp. n., in Egypt, **109.**
Culicoides subnitidus, in Northern Australia, **8.**
Culiseta incidens, breeding-places of, in California, **159.**
cumminsi, *Ochlerotatus*.
cumpstoni, *Ochlerotatus* (*Culicada*).
cuniculi, *Psoroptes*; *Spilopsyllus*.
cuprarius, *Sargus*.
curvata, *Doratopsylla*.
curvinervis, *Chaetoneurophora*.
cuspis, *Doratopsylla*.
cyaniventris, *Dermatobia* (see *D. hominis*).
Cyanocitta stelleri carlottae (Queen Charlotte Jay), *Ixodes auritulus* on, in Canada, **80.**
Cyathomyia fusca, in French Guinea, **21.**
Cyclopodia greeffi, not infected wit *Trypanosoma gambiense*, **101.**
cylindrica, *Nemopoda*.

Cynocephalus, parasites in the lungs of, **40**.
Cynomyia cadaverina, trapped with milk baits in U.S.A., **5**.
Cynomyia mortuorum, not likely to be spread by man, **96**.
Cynonycteris straminea, susceptibility of, to trypanosomes, **101**.
Cytisine, against lice, **193**.
Cytodites nudus, in lungs of fowls, **41**.

D.

Dalmatian Insect Powder, against cockroaches, **141**.
Danais petiverana, **21**.
Darwin (N. Australia), distribution of mosquitos in, **72**.
dasycnemus, Doratopsylla.
Dasypus sexcinctus, infected with *Trypanosoma cruzi*, **38**.
Dasyurus maculatus, *Ixodes tasmani* on, in Australia, **55**.
debilipalpis, Culicoides.
debilis, Phalangomyia.
decens, Culex.
decipiens, Catallagia.
decoloratus, Margaropus (Boophilus).
decumani, Myonyssus ; Nuttallia.
Deer, *Ixodes ricinus* on, in Canada, **80** ; *Margaropus caudatus* on, in Guam, **191**.
demandata, Chrysomyza.
Demoplatus australis, in New South Wales, **182**.
Demoplatus trichocerus, in New South Wales, **182**.
Dengue Fever, relation of *Stegomyia fasciata* to, in Australia, **73, 148, 149, 196**.
Denmark, *Lucilia sericata* causing myiasis in, **88**.
denshami, Tabanus.
dentatus, Ixodes ; Ochlerotatus.
dentipes, Hydrotaea.
dentulosum, Simulium.
derivator, Culex.
Dermacentor, conveying Rocky Mountain spotted fever in U.S.A., **76, 77**.
Dermacentor albipictus, **154** ; hosts of, in Canada, **80**.
Dermacentor reticulatus, on man in Britain, **142**.
Dermacentor reticulatus var. *aulicus*, n., on wild boars in France, **86**.
Dermacentor variabilis, bionomics of, in Canada, **80** ; on dogs in U.S.A., **58**.
Dermacentor venustus (Spotted Fever Tick), **176** ; on dogs in U.S.A., **58** ; and Rocky Mountain spotted fever, **154**.
Dermanyssus gallinae (Poultry Mite), hosts of, in Britain, **142** ; on fowls in Guam, **191** ; attacking birds in French Guinea, **21** ; distribution of, **13** ; probably replaced in the Tropics by *Liponyssus bursa*, **159**.
Dermanyssus hirundinis, attacking birds in French Guinea, **21**.
Dermanyssus muris, on *Epimys rattus* in Britain, **142**.
Dermatitis, caused by Staphylinid beetles in Africa and Brazil, **15, 51, 167**.
Dermatobia cyaniventris (see *D. hominis*).
Dermatobia hominis, bionomics of, **157** ; causing myiasis in Panama, **105** ; infesting dogs in U.S.A., **58**.
Dermatophilus penetrans (Chigger or Chigoe Flea), distribution of, **5** ; in dogs, **58**.
devia, Brachycoma.
Diachlorus bimaculatus, in Brazil, **36**.
Diachlorus immaculatus, in Brazil, **36**.
Diarrhoea, and house-flies in India and Gallipoli, **124, 143**.
Diatomineura auriflua, in New South Wales, **182**.
Diatomineura brevirostris, in New South Wales, **182**.
Diatomineura inflata, in New South Wales, **182**.
Diatomineura minima, in New South Wales, **182**.
Dibrachys, parasite of household insects, **121**.
Dichelacera, in Brazil, **37**.
Digonochaeta spinipennis, in houses in Britain, **144**.
dimorphon, Trypanosoma.
Dineutes, preying on Anopheline larvae in U.S.A., **137**.
Dips for cattle, formulae for, **46, 107** ; chemistry of arsenical, **3, 46** ; effect of, on biting-flies, **170** ; formula for, against mange on horses, **165** ; for scabies, etc., in sheep, **148, 179, 184–186, 187–189** ; for protecting sheep from blow-flies in Australia, **70, 187** ; against tick-borne diseases, **3, 46, 73, 107, 160, 171, 192**.
Dipylidium caninum, carried by *Ctenocephalus canis*, **58**.
discolor, Psorophora.
dispar, Chrysops ; Lucilia (see *Phormia sordida*) ; *Trichocephalus.*
dissimilis, Goniodes.
distincta, Pyrellia.
distinctipennis Chrysops

ditaeniatus, Tabanus.
ditissima, Pyrellia.
divergens, Piroplasma.
diversifurcatum, Simulium.
Dixomyia elegans (see *Ficalbia*).
Docodon verticillatus, larvae of *Taeniorhynchus perturbans* associated with, **170**.
Docophorus icterodes, on geese in U.S.A., **13**.
Dogs, control of fleas on, **35**; *Cordylobia anthropophaga* on, in Africa, **138**; disease of, in Brazil, due to *Rangelia vitalii*, **59**; babesiasis of, in the Gold Coast, **42**; possible reservoir of leishmaniasis in Persia, **9**; trypanosomiasis of, in the Sahara, **157**; pests of, in Sierra Leone, **150**; diseases of and parasites carried by, in U.S.A., **57**; fleas on, destroyed by nitrobenzine, **79**; transmission of leishmaniasis in, **103**; tick-borne diseases in, **34**, **64**, **68**; ticks infesting, **34**, **80**, **142**, **192**; trypanosomiasis in, in West Africa, **42**; *Wohlfartia magnifica* causing myiasis in, **88**.
Dog Flea (see *Ctenocephalus canis*).
Dohrniphora abdominalis, **51**.
domestica, Musca (*Promusca*).
domesticus, Glyciphagus; *Ochlerotatus.*
domicolus, Anopheles.
Donkeys, ticks on, in Egypt and Libya, **15**, **192**; killed by *Simulium* in Hungary, **158**; trypanosomiasis in, **151**; partial immunity of, to trypanosomiasis, **48**.
donovani, Leishmania.
Doratopsylla antiquorum, in Brazil, **33**.
Doratopsylla blarinae, in U.S.A., **33**.
Doratopsylla curvata, sp. n., on mice in North America, **33**.
Doratopsylla cuspis, sp. n., on *Sorex araneus* in Hungary, **33**.
Doratopsylla dasycnemus, distribution of, in Europe, **33**.
Doratopsylla intermedia, from Central America, **33**.
Dourine, disease resembling, in mules in the Gold Coast, **42**.
Dove, *Lynchia maura* on, in Nyasaland, **171**.
Dracaena, providing a breeding-place for mosquitos in Sierra Leone, **161**.
Drosophila ampelophila, experiments with baits for, **106**.
Dryomyza flaveola, bionomics of, in Britain, **143**.
dubiosa, Paratricyclea.
duboscqi, Phlebotomus.
Ducks, infected with spirochaetosis by *Argas persicus*, **192**; *Trinoton luridum* infesting, **13**.
dumalis, Amphipsylla.
duodenale, Ankylostoma.
Durban, list of mosquitos from, **120**.
durbanensis, Ochlerotatus.
durhami, Limatus.
duttoni, Culex.
dux, Ctenophthalmus.
dyari, Culex.
Dysentery, and house-flies in Gallipoli, **143**; incidence of, reduced by destruction of house-flies, **93**; relation between flies and, in India, **124**.

E.

East Coast Fever (see African Coast Fever).
eatoni, Ochlerotatus.
eburneum, Amblyomma.
Echestypus paradoxus, on bushbuck and wart-hog in Nyasaland, **171**.
echidninus, Laelaps.
Echidnophaga gallinacea, control of, on fowls, **35**; distribution of, **4**; on dogs, **58**; on fowls infested with spirochaetosis, **81**; on turkeys, **13**.
Echinophthirius fluctus, sp. n., on *Eumetopias jubata*, **196**.
Echinorhynchus gigas, insect hosts of, **176**.
echis, Atyphloceras.
ecinctus, Rhipicephalus.
Ectenopsis vulpecula, in New South Wales, **182**.
Ectobia germanica (see *Phyllodromia*).
Ectomocoris ululans, probably not a carrier of goitre in Algeria, **139**.
Ecuador, *Stegomyia fasciata* and yellow fever in, **149**.
edax, Haltichella.
Egypt, disease resembling African coast fever in, **7**; ticks infesting domestic animals in, **192**; parasitic worms in cattle in, **70**; fumigation with hydrocyanic acid against bed-bugs in, **86**; use of traps for flies in, **142**.
Egyptian Fever, in cattle, **192**; carried by *Margaropus annulatus*, **7**.
eichhorni, Ixodes.
eiseni, Anopheles.
elater, Allactaga.
elatus, Ceratophyllus.
elegans, Anopheles; *Ficalbia* (*Dixomyia*).
elegantula, Forcipomyia.

Elephant, African, Oestrids of, in the Belgian Congo, **40**.

Elephant, Indian, parasitised by *Cobboldia elephantis*, **40**.

elephantis, Cobboldia.

Elk, *Dermacentor albipictus* on, in Canada, **80**.

Ellobius ursulus, Amphipsylla dumalis on, in Turkestan, **32**; *Ctenophthalmus dux* on, in Turkestan, **32**.

elongatus, Silvius.

emblica, Phyllanthus.

emersoni, Phanurus.

Empusa, infesting house-flies, **146**, **169**.

Enderleinellus kelloggi, sp. n., on *Sciurus griseus nigripes* in North America, **177**.

Enderleinellus uncinatus, sp. n., on *Glaucomys sabrinus lascivus* in North America, **177**.

enormis, Hoplopleura.

Enteric (see Typhoid).

Entomological Appointments, notices of, **100**, **132**.

Epimys fulvescens, a new *Neopsylla* on, in India, **33**.

Epimys norvegicus, mites on, in Britain, **141**, **142**.

Epimys rattus, Dermanyssus muris on, in Britain, **142**; (see *Mus*).

Epimys rufescens, Ixodes granulatus on, in India, **55**.

equi, Chorioptes (*Symbioies*); *Gastrophilus*; *Nuttallia*; *Psoroptes communis*; *Sarcoptes scabici*; *Trichodectes* (see *T. parumpilosus*).

equiperdum, Trypanosoma.

Erephopsis jacksoni, in New South Wales, **182**.

Erephopsis pubescens, in Brazil, **36**.

Erephopsis pygmaea, sp. n., in Brazil, **36**.

Erephopsis seionoides, sp. n., in Brazil, **36**.

Erephopsis xanthopogon, in Brazil, **36**.

Eretmopodites chrysogaster, breeding places of, in Sierra Leone, **163**.

Eretmopodites dracaenae, sp. n., in Sierra Leone, **64**, **161**, **163**.

Eretmopodites inornatus, breeding-places of, in West Africa, **45**, **112**.

Eretmopodites quinquevittatus, distribution of, in Africa and Madagascar, **120**; breeding-places of, in Sierra Leone, **45**, **163**.

erinacei, Archaeopsylla (*Ctenocephalus*).

Erinaceus, Archaeopsylla erinacei on, in Caucasia, **151**.

eriophthalma, Pyrellia.

Eristalis tenax, bred from manure heaps in England, **108**.

Eritrea, disease-carrying insects in, **156**.

erratica, Phaonia.

erythrocephala, Calliphora; *Ornithoctona.*

erythrothorax, Culex.

Eucalyptus, in dips for protecting sheep from blow-flies, **71**; against cockroaches, **140**.

eudyptidis, Ixodes.

Euforcipomyia fusicornis, in Illinois, **55**.

Euforcipomyia hirtipennis, sp. n., in Illinois, **55**.

Euglena viridis, Simulium larva feeding on, **82**.

Eumelanomyia inconspicuosa, breeding-places of, in West Africa, **112**.

Eumetopias jubata (Stellar Sea-lion), a new *Echinophthirius* on, **196**.

Eumusca australis, in New South Wales, **159**.

Eupelminus tarsatus, sp. n., parasite of *Glossina morsitans* in Nyasaland, **29**, **65**, **113**.

Europe, distribution of *Wohlfartia magnifica* in, **88**.

European Mouse Flea (see *Leptopsylla musculi*).

European Rat Flea (see *Ceratophyllus fasciatus*).

evertsi, Rhipicephalus.

Evotomys glareolus, Laelaps festinus on, in Britain, **142**.

Evotomys saturatus, Catallagia charlottensis on, in Alberta, **33**; *Neopsylla inopina* on, in Canada, **33**.

exaratum, Stomatoceras (*Centrochalcis*).

exornatum, Aponomma.

expositicius, Haemaphysalis.

F.

faceta, Neopsylla.

fahrenholzi, Linognathus.

Fahrenholzia tribulosa, sp. n., on *Perognathus californicus* in North America, **177**.

falcatus, Rhipicephalus.

falciparum, Plasmodium.

Fannia armata, in houses in Britain, **144**.

Fannia canicularis, bionomics of, in Britain, **108**, **143**, **169**; traps for, in Egypt, **142**; in Gallipoli, **92**; in Salonica, **179**; trapped with milk-baits in U.S.A., **5**; in relation to disease, **45**.

Fannia manicata, bionomics of, in Britain, **143**.

Fannia scalaris, bionomics of, in Britain, 143, 169; in Gallipoli, 92; trapped with milk-baits in U.S.A., 5; in relation to disease, 45.
Fannia setigena, sp. n., from Ruwenzori, 125.
fasciata, Stegomyia.
fasciatus, Ceratophyllus; *Tabanus.*
fasciculata, Crithidia.
fasciolatus, Taeniorhynchus.
fatigans, Culex.
felis, Ctenocephalus.
Felis tigris, Ixodes granulatus on, in India, 55.
fenestralis, Oecothea.
Fennel, Oil of, against lice, 153.
fergusoni, Culicada.
ferruginea, Aphiochaeta.
festinus, Laelaps.
Ficalbia elegans, in Queensland, 60.
fidus, Ceratophyllus.
Fiji, mosquitos and house-flies in, 41.
Filariasis, not present in Jamaica, 90.
Finlaya poicilia, in Northern Australia, 11; in Fiji, 41; in Queensland, 60; in Sumatra, 23.
Fish, experimentally infected with insect flagellates, 103; use of, against mosquito larvae, 44, 69, 99, 195; predaceous on *Simulium* larvae, 82.
flaveola, Dryomyza.
flavicornis, Cantharis.
flavigenum, Paraplasma.
flavipes, Calliphora.
flavothorax, Tabanus.
Fleas, in West Africa, 66, 81, 150; list of, in Britain, 166; list of, from Caucasia and Persia, 151; distribution of, on rats in Java, 128; in Muscat, 173; in New South Wales, 181; from Turkestan, 32; bionomics and control of, in U.S.A., 13, 34, 58; new species of, 32, 33, 151; in relation to leishmaniasis, 49, 63, 103; a new parasite of, 125; and plague, 4, 5, 34, 86; relation between rats and, 127, 150, 181; on ships, destroyed by Clayton gas, 94; experiments with hydrocyanic acid against, 155; effect of nitrobenzine on, 79; traps for, 5.
Florida, *Dermatophilus penetrans* in, 5.
floridanus, Phanurus.
fluctus, Echinophthirius.
Forcipomyia elegantula, sp. n., in Illinois, 55.
Forcipomyia lefanui, sp. n., in the Gold Coast, 109.
Forcipomyia townsendi, probably transmitting Uta in Peru, 63.
Forcipomyia utae, probably transmitting Uta in Peru, 63.
Formaldehyde, in baits for house-flies, 181; fumigation with, against poultry mites, 53, 167; retarding oxidation of arsenical dips, 3.
Formalin, in baits for house-flies, 20, 92, 169.
formosaensis, Anopheles.
fossarum, Gerris.
fowleri, Anopheles.
Fowls, parasites of, in West Africa, 21, 81; mites on, in Australia, 159; *Dermanyssus gallinae* on, in Britain, 142; *Ixodes marxi* on, in Canada, 80; lice and mites on, in Guam, 191; parasites of, and their control in U.S.A., 35, 53, 79, 166; experiments with *Argas persicus* and fowl plague in, 62; *Argas persicus* transmitting spirochaetosis in, 101, 192; cholera in, relation of *Simulium* to, 82; *Cytodites nudus* in lungs of, 41; poisonous effects of *Macrodactylus subspinosus* on, 26; *Wohlfartia magnifica* causing myiasis in, 88.
France, *Dermacentor reticulatus* var. *aulicus* on wild boar in, 86; *Geophilus carpophagus* infesting man in, 102; measures against house-flies in, 179; malaria in, 20; mites attacking man in, 68; mosquito larvae in, 156; fish imported from, into Madagascar against mosquito larvae, 195; *Phlebotomus papatasii* in, 49; *Phormia azurea* in, 78; *Stegomyia fasciata* in, 40.
fransciscanus, Anopheles; *Ceratophyllus ignotus.*
fraseri, Uranotaenia bilineata.
Fratercula arctica, ticks on, in Britain, 142.
freetownensis, Culiciomyia.
Fregata aquila, Pseudolfersia spinifera on, in Brazil, 137.
French Guinea, blood-sucking insects of, 21.
French Sanitary League, bulletins of, 17.
frenchi, Culex.
Frogs, experimentally infected with insect flagellates, 103.
frontalis, Silvius.
fugax, Chortophila.
fuliginosus, Anopheles; *Silvius.*
Fulmarus glacialis, ticks on, in Britain, 142.
fulva, Hippobosca.
fulvohirtus, Silvius.

fulvorufula, Cervicapra.

Funambulus palmarum, Hyalomma aegyptium on, in Libya, **15.**

Fundulus gardneri, destroying mosquito larvae in Sierra Leone, **44.**

funebris, Chrysops.

funerea, Aëdes (*Skusea*).

funestus, Anopheles (*Myzomyia*).

fusca, Cyathomyia ; *Glossina* ; *Olfersia.*

fuscipes, Paederus ; *Tabanus.*

fuscopennatus, Taeniorhynchus.

fuscus, Culex.

fusicornis, Euforcipomyia (*Ceratopogon*).

G.

Gallus domesticus (see Fowls).

gallinacea, Echnidophaga.

gallinae, Ceratophyllus ; *Dermanyssus.*

Gallipoli, measures against flies in, **91** ; fly-borne diseases in, **143.**

Gamasus, infesting house-flies in Britain, **146.**

Gamasus coleoptratorum, **146.**

Gambia, new Calliphorine flies from, **126** ; mosquitos in, **120** ; quarantine measures against *Stegomyia fasciata* and yellow fever in, **159.**

gambiense, Trypanosoma.

gambiensis, Paratricyclea.

Game, relation of, to *Glossina* in Africa, **36, 47, 77, 114, 115, 117** ; piroplasmosis in, in the Belgian Congo, **68** ; trypanosomiasis in, in Nyasaland, **19** ; parasites of, **171.**

Gastrophilus equi, **194** ; in French Guinea, **22** ; infesting horses in Morocco, **164** ; protection of horses from, **56** ; carbon bisulphide against, **62.**

Gastrophilus haemorrhoidalis, **194** ; infesting horses in Morocco, **164.**

Gastrophilus inermis, infesting a rook in Turkestan, **24.**

Gastrophilus magnicornis, sp. n., infesting mules in Eritrea, **156.**

Gastrophilus nasalis (Nose-fly), infesting horses in Canada, **194** ; in mules in French Guinea, **22** ; infesting horses in Morocco, **164.**

Gastrophilus veterinus (see *G. nasalis*).

Gecinus vaillantii, Dermanyssus gallinae on, in Britain, **142.**

Geese, lice infesting, in U.S.A., **13** ; *Wohlfartia magnifica* causing myiasis in, **88** ; infected with spirochaetosis by *Argas persicus*, **192.**

gelidus, Culex.

geminata, Solenopsis.

geniculata, Triatoma.

geniculatus, Culex.

gennrostris, Harpagomyia.

geometrica, Uranotaenia.

Geomys, Ceratophyllus ignotus albertensis on, in Alberta, **33.**

Geophilus carpophagus, infesting man in France, **102.**

Georychus hottentotus, a new *Haemolaelaps* on, in Cape Colony, **142.**

germanica, Phyllodromia (*Blatta, Ectobia*).

Germany, little known species of mosquitos in, **16** ; use of protective fluids against mosquitos in, **61** ; *Phormia azurea* in, **78** ; causes of staggers in sheep in, **10** ; cattle killed by *Simulium reptans* in, **126.**

Gerris fossarum, experimental transmission of flagellates of, **103.**

gibbosus, Ixodes ricinus.

gibbus, Listrophorus.

gibsoni, Ochlerotatus ; *Onchocerca.*

gigas, Anopheles ; *Echinorhynchus* ; *Goniocotes* ; *Myonyssus.*

Glaucomys sabrinus lascivus, Enderleinellus uncinatus, sp. n., on, in North America, **177.**

Glossina, and sleeping sickness, **12, 18, 56, 176** ; probably not the only carriers of trypanosomiasis, **151** ; effect of dips on, **171** ; (see Tsetse Flies).

Glossina austeni, in Zululand, **121.**

Glossina brandoni (see *G. austeni*).

Glossina brevipalpis, **36, 68** ; bionomics and distribution of, in the Belgian Congo, **31** ; bionomics of, in Nyasaland, **18, 29, 113, 171** ; in Northern Rhodesia, **117** ; relation of, to trypanosomiasis, **18, 171.**

Glossina caliginea, in Nigeria, **66.**

Glossina fusca, **36** ; distribution of, in the Belgian Congo, **56** ; in Sierra Leone, **45** ; types of trypanosomes transmitted by, **68.**

Glossina longipalpis, in Sierra Leone, **45.**

Glossina morsitans, **44, 46** ; distribution of, in E. Africa, **47** ; distribution of, in French Equatorial Africa, **84** ; bionomics and distribution of, in the Belgian Congo, **30, 36, 56, 68** ; in French Guinea, **21** ; bionomics of, in Nyasaland, **18, 28–30, 65, 113–116** ; bionomics of, in Rhodesia, **77, 108, 117** ; parasites of, **65, 113, 114, 116, 117, 122** ; attempts to control, **29, 47, 114, 130.**

Glossina pallidipes, in Zululand, **121.**

Glossina palpalis, **46**; distribution of, in French Equatorial Africa, **21, 83**; distribution of, in the Belgian Congo, **36, 43, 56, 68**; in the Gold Coast, **81**; trypanosomes found in, in the Ivory Coast, **84**; in Nigeria, **66, 112, 116**; history of extermination of, in Principe, **48**; in Sierra Leone, **45, 150**.

Glossina tachinoides, distribution of, in French Equatorial Africa, **84**; in Nigeria, **112**.

glossinae, Mutilla; *Syntomosphyrum*.

Glyciphagus domesticus, in Norway, **180**.

Goats, *Psoroptes communis* var. *caprae* on, in South Africa, **186**; measures against mange in, in Ceylon, **123**; trypanosomes rare in, in the Gold Coast, **42**; *Margaropus caudatus* on, in Guam, **191**; heart-water in, carried by *Amblyomma hebraeum*, **64**; serum of, fatal to *Leishmania donovani*, **174**; control of lice on, **91**; *Psoroptes communis* var. *ovis* unable to live on, **185**.

Goitre, probably not carried by blood-sucking Rhynchota in Africa, **139**.

Gold Coast, blood-sucking insects of, **12, 81**; insect-borne diseases in, **42, 151**; mosquitos in, **28, 81, 120, 165**.

Gongylonema scutatum, lists of insects carrying, **63**.

Goniocotes compar, on pigeons in U.S.A., **13**.

Goniocotes gigas, on fowls in Guam, **191**; on fowls in U.S.A., **13**.

Goniocotes hologaster (Lesser Chicken Louse), on fowls in U.S.A., **13**.

Goniodes dissimilis, on fowls in U.S.A., **13**.

Goniodes pavonis, on peacocks, **13**.

Goniodes stylifer, on turkeys, **13**.

gorgasi, Anopheles.

grabhami, Anopheles; *Culex*.

Grabhamia, in New South Wales, **182**.

Grabhamia theobaldi (see *Ochlerotatus*).

gracilis, Haematopota.

granulatus, Ixodes.

Graphomyia americana, trapped with milk-baits in U.S.A., **5**.

Graphomyia maculata, in houses in Britain, **144**.

greeffi, Cyclopodia.

gregarius, Tabanus.

Grenada, a new *Wyeomyia* from, **64**.

grenadensis, Wyeomyia.

griseus, Pseudoculicoides.

groenlandica, Protocalliphora (*Calliphora, Phormia*).

Guam, ticks and lice infesting domestic animals in, **191**.

Guatemala, *Phlebotomus papatasii* in, **177**.

guiarti, Culex.

Guinea-pigs, serum of, fatal to *Leishmania donovani*, **174**; *Paraplasma* in, **66**; experimentally infected with Rocky Mountain spotted fever, **77, 154**; negative result of inoculating *Trypanosoma vivax* into, **42**.

gundi, Ctenodactylus.

guttatus, Culicoides.

guttipennis, Culicoides.

gutturosa, Onchocerca.

H.

Habronema muscae (see *Spiroptera macrostoma*).

Haemaphysalis calcarata, in Italian Somaliland, **70**.

Haemaphysalis chordeilis, on turkeys, **13**.

Haemaphysalis cinnabarina, **34**; hosts of, in Canada, **80**.

Haemaphysalis cinnabarina var. *punctata*, transmitting *Piroplasma convergens* in cattle in Britain, **34**; on goats in Smyrna, **55**.

Haemaphysalis concinna, parasitised by *Ixodiphagus caucurtei*, **34**.

Haemaphysalis expositicius, in Canada, **80**.

Haemaphysalis inermis, parasitised by *Ixodiphagus caucurtei*, **34**.

Haemaphysalis leachi, transmitting canine piroplasmosis in Africa, **34, 64**; on dogs in Egypt, **192**; on hedgehogs in the Gold Coast, **81**; in Nigeria, **66, 113**; in Sierra Leone, **45**; in Italian Somaliland, **70**.

Haemaphysalis leporis-palustris, hosts of, in Canada, **80**; parasitised by *Ixodiphagus texanus*, **34**.

Haematobia irritans (see *Lyperosia*).

Haematopinus asini, formulae for control of, on horses, **178**.

Haematopinus macrocephalus (see *H. asini*).

Haematopinus microcephalus (see *H. pedalis*).

Haematopinus ovillus, on sheep in New Zealand, **111**.

Haematopinus pedalis, on sheep in New Zealand, **111**.

Haematopinus phacochoeri, on *Potamochaerus choeropotamus* in South Africa, **120**.
Haematopinus tuberculatus, in Northern Australia, **8**.
Haematopota (Chrysozona), in the Belgian Congo, **68**.
Haematopota bullatifrons, in Sierra Leone, **45**.
Haematopota gracilis, in Nigeria, **66**, **112**.
Haematopota lacessens, in Nigeria, **66**, **112**; in Sierra Leone, **45**.
Haematopota malayensis, sp. n., from the Malay States, **65**.
Haematopota pertinens, in Nigeria, **66**, **112**.
Haematopota puniens, in Nigeria, **66**, **112**.
Haematopota similis, in Sierra Leone, **45**.
Haematopota singalensis, attacking cattle in Ceylon, **123**.
Haematopota stantoni, sp. n., from Malay States, **65**.
Haematopota torquens, in Sierra Leone, **45**.
Haematopota vittatus, in Nigeria, **66**, **112**.
haematopotus, Culicoides.
Haemogamasus hirsutus, hosts of, in Britain, **142**.
Haemogamasus horridus, hosts of, in Britain, **142**.
Haemogamasus liberiensis, sp. n., on *Mus trivirgatus* in Liberia, **142**.
Haemogamasus nidi, hosts of, in Britain, **141**.
Haemogamasus oudemansi, on brown rat in Britain, **142**.
Haemogregarines, in reptiles in the Gold Coast, **81**.
Haemolaelaps capensis, sp. n., on *Georychus hottentotus* in Cape Colony, **142**.
Haemoproteus columbae, carried by *Lynchia capensis*, **189**.
haemorrhoidalis, Gastrophilus; *Sarcophaga.*
Haliaetus leucocephalus alascanus (Alaska Bald Eagle), *Ixodes auritulus* on, in Canada, **55**, **80**.
Haltichella edax, sp. n., parasite of *Glossina morsitans* in Nyasaland, **65**.
halifaxi, Culex.
Harpagomyia genurostris, in Sumatra, **23**.
Harpiprion cayennensis, a new *Olfersia* on, in Brazil, **137**.
Havana, anti-mosquito work in, **176**; campaign against yellow fever in, **99**, **110**.
hearseyana, Sphyracephala.
hebes, Mesopsylla.
hebraeum, Amblyomma.
hebraeus, Polistes.
hebridensis, Apodemus.
helicis, Sarcophaga.
Helomyza olens, in houses in Britain, **144**.
Hemimerus talpoides, on *Cricetomys gambianus* in the Gold Coast, **81**.
hemiptera, Cimex.
Herpetomonas ctenocephali, conveyed by fleas, **103**.
Herpetomonas culicis, from *Culex pipiens*, fatal to birds, **44**.
Herpetomonas jaculum, from *Nepa cinerea*, fatal to birds, **44**.
Herpetomonas pattoni, conveyed to rats by *Ceratophyllus fasciatus*, **103**.
Herpetomoniasis, induced in birds, **43**.
heterochaeta, Passeromyia (Muscina).
heterographus, Lipeurus.
hexagonus, Ixodes.
hilaris, Laelaps; *Tabanus.*
hilli, Silvius.
Hippobosca, in Salonica, **179**; in Sierra Leone, **150**.
Hippobosca camelina, in Eritrea, **156**.
Hippobosca fulva, on antelopes in Nyasaland, **171**.
Hippobosca maculata, in Eritrea, **156**; on domestic animals in French Guinea, **21**; in Nigeria, **113**.
Hippoboscidae, infesting birds in South America, **137**; associated with trypanosomiasis in Eritrea, **156**; infesting birds in U.S.A., **169**.
Hippocentrum murphyi, in Sierra Leone, **45**.
Hippocentrum trimaculatum, in Sierra Leone, **45**.
Hippocentrum versicolor, in Nigeria, **66**.
hircus, Capra.
hirsuta, Hoplopleura.
hirtipennis, Euforcipomyia.
hirundinis, Dermanyssus; *Stenopteryx.*
Hirundo, attacked by *Passeromyia heterochaeta* in Africa, **16**.
Hirundo rufula, Dermanyssus spp. on, in French Guinea, **21**.
Hirundo rustica, Dermanyssus gallinae in nests of, in Britain, **142**.
hispaniola, Anopheles (see *A. turkhudi*).
hispida, Mimomyia.
hispidus, Sigmodon.
Hodgesia triangulata, in Northern Australia, **11**.

Holland, *Lucilia sericata* causing myiasis in, **88**.

hologaster, Goniocotes.

hololeucus, Niptus.

holoptera, Olfersia.

holosericeum, Trombidium.

Holotaspis, infesting house-flies in Britain, **146**.

Holotrichius, not known to attack man in Algeria, **139**.

hominis, Dermatobia.

Hong Kong, distribution of mosquitos in, **39**; Tabanidae from, **65**.

hongkongiensis, Tabanus.

hookeri, Hunterellus.

Hoplopleura enormis, sp. n., on *Arvicanthis dorsalis* in Zululand, **120**.

Hoplopleura hirsuta, sp. n., on *Sigmodon hispidus* in North America, **177**.

Hoplopleura intermedia, on *Mus coucha* in South Africa, **120, 121**.

Hoplopsyllus anomalus, capable of carrying plague, **4**.

horridus, Haemogamasus.

Horses, attacked by *Stomoxys calcitrans* in Britain, **109**; parasites of, in Canada, **80, 194**; ticks on, in Egypt, **192**; attacked by *Stomoxys* in the Gold Coast, **151**; insects attacking, in French Guinea, **21, 22**; *Margaropus caudatus* on, in Guam, **191**; killed by *Simulium* in Hungary, **158**; *Hyalomma aegyptium* on, in Libya, **15**; Oestrids infesting, in Morocco, **164**; Tabanids on, in New South Wales, **182**; *Simulium placidum*, sp. n., on, in Trinidad, **30**; attacked by *Simulium venustum* in U.S.A., **81**; infecting Tabanids with anthrax, **101**; use of cod-liver oil to protect, from flies, **34**; protection of, from *Gastrophilus equi*, **56, 62**; control of lice on, **10, 158, 178**; treatment of mange on, **70, 126, 165**; flies causing myiasis in, **2, 88**; not attacked by *Psoroptes communis* var. *cuniculi*, **187**; tick-borne diseases in, **64**; trypanosomiasis of, in Africa, **42, 156, 157**.

Horse Sickness, nature and distribution of, in Africa, **27**.

hortorum, Morellia.

House-flies, control of, in South Africa, **80**; bionomics of, in Britain, **87, 102, 108, 121, 143–147, 167–169**; natural enemies of, in Fiji, **41**; measures against, in France, **179**; and disease in Gallipoli, **91, 143**; bionomics and control of, in British Guiana, **194**; relation of, to disease in India, **92, 124**; bionomics of, in U.S.A., **5, 62**; dispersal of, in towns in U.S.A., **78, 147**; in relation to disease, **2, 18, 45, 176**; possible carriers of *Leishmania*, **9**; transmission of leprosy by, **85**; relation of, to parasitic worms, **12, 54**; experiments with, in manure heaps, **22, 108, 141, 147, 167**; measures for protecting domestic animals from, **158**; control measures against, **5, 18, 20, 91, 92, 141, 142, 143, 147, 168, 179, 191, 194**; formula for spray against, **191**; formula for adhesives for trapping, **53**; experiments with traps and baits for, **14, 20, 92, 106, 107, 142, 144, 145, 167, 168, 169, 181**; reactions of, to blue and green light, **156**; (see also *Musca domestica*).

Human Flea (see *Pulex irritans*).

humanus, Pediculus.

humeralis, Taeniorhynchus.

Hungary, *Simulium* attacking domestic animals in, **158**.

Hunterellus hookeri, a parasite of *Rhipicephalus sanguineus* in Brazil, **39**.

Hyaena vulgaris, fleas on, in Caucasia, **151**.

hyaenae, Vermipsylla.

Hyalomma aegyptium, on domestic animals in Egypt, **192**; probably transmitting *Piroplasma* in the Gold Coast, **42**; probably carrying Mediterranean coast fever in Libya, **15**; in Nigeria, **66, 113**; on goats in Smyrna, **55**; in Italian Somaliland, **70**; probably infecting horses with *Nuttallia equi*, **64**.

Hyalomyia rufiventris, placed in genus *Austrophasia*, **159**.

hybridus, Pirates; *Tabanus.*

Hydrochloric Acid, for controlling breeding-places of house-flies, **147**; effect of, on larvae of *Wohlfartia magnifica*, **89**.

Hydrocyanic Acid Gas, against bed-bugs, **86, 94, 135, 155**; against fleas, **35**; against household pests, **135**; experiments with, for killing rats, **75**; methods and apparatus for fumigating with, **25, 35, 86, 155, 175**; method of fumigating ships with, **94**.

Hydropsyche, predaceous on *Simulium* larvae, **82**.

Hydrotaea dentipes, bionomics of, in Britain, **108, 143**.

Hydrotaca irritans, in houses in Britain, **144**.
Hydrotaea meteorica, attacking cattle in U.S.A., **107**.
hyoscyami, Pegomyia.
Hypoderma, infesting cattle in Quebec, **122**.
Hypoderma bovis, legislation against introduction of, into Australia, **73**; infesting cattle in Canada, **194, 195**.
Hypoderma lineata, infesting cattle in Canada, **194, 195**.
Hyoscyamus, extract of, against larvae of *Wohlfartia magnifica*, **89**.
Hystrichopsylla satunini, sp. n., on *Hyaena vulgaris* in Caucasia, **151**.

I.

icterodes, Docophorus.
ignotus, Ceratophyllus.
Ikaphthisol, against lice on horses, formulae for, **158**.
Illinois, blood-sucking midges from, **55**.
imitans, Paratricyclea.
immaculatus, Diachlorus.
Impala, *Hippobosca fulva* on, in Nyasaland, **171**.
impiger, Ochlerotatus (*Aēdes*).
impuncta, Mydaea.
incidens, Culiseta.
inconspicuosa, Eumelanomyia.
incrustatum, Simulium.
indefinitus, Anopheles rossi.
India, bionomics of *Anopheles plumbeus* in, **74**; classification of Anophelines in, **74**; experiments with bed-bugs and kala-azar in, **103, 124, 174**; investigations of blood-sucking insects in, **91**; new fleas from, **33**; control of breeding places of flies in, **92**; life-histories of *Haematobia sanguisugens* and *Bdellolarynx sanguinolentus* in, **75**; relation of house-flies to disease in, **124**; mosquitos from, **64, 74, 120**; breeding-places of mosquitos in, **118**; mosquitos and malaria in, **54, 85**; *Onchocerca indica* infesting *Bos indicus* in, **70**; early stages of *Phlebotomus* spp. in, **32**; piroplasmosis in dogs carried by *Rhipicephalus sanguineus* in, **64**; breeding-places of *Stygeromyia maculosa* in, **24**; ticks in, **55**..
Indian Rat Flea (see *Xenopsylla cheopis*).
indianus. Tabanus.
indica, Onchocerca.
indicus, Bos; *Chaoborus.*
inermis, Gastrophilus; *Haemaphysalis.*
infantum, Leishmania.
inflata, Diatomineura.
infuscata, Probezzia.
ingens, Trypanosoma.
ingrami, Culex.
inopina, Neopsylla.
inornata, Culicada.
inornatus, Ctenophthalmus.
insidiosus, Triphleps.
insignis, Culex.
intermedia, Doratopsylla; *Hoplopleura*; *Wohlfartia.*
intermedius, Phlebotomus.
intertropica, Olfersia.
invidiosus, Culex.
Iodoform, in dips for protecting sheep from blow-flies, **71**; against lice, **133, 193**.
iridatus, Sargus.
Iron Sulphate, against house-fly larvae, **5**.
irritans, Hydrotaea; *Lyperosia* (*Haematobia*); *Ochlerotatus*; *Pulex.*
irroratus, Otomys.
Ismailia, anti-mosquito work in, **176**.
Isometrus maculatus, destroying mosquitos in Sierra Leone, **163**.
Italy, measures against lice in, **153, 154**; malaria and mosquitos in, **19**; cattle from, nearly immune to Mediterranean Coast fever, **15**; mosquito larvae in, **156**; anti-mosquito measures in, **152**; *Phormia azurea* in, **78**.
Ivory Coast, *Glossina* and trypanosomiasis in, **84**.
Ixodes, **34**.
Ixodes anatis, hosts of, in New Zealand, **55**.
Ixodes angustatus, life-cycle of, in Canada, **80**.
Ixodes auritulus, distribution of, **55**; hosts of, in Canada, **80**.
Ixodes caledonicus, hosts of, in Britain, **142**.
Ixodes dentatus var. *spinipalpis*, n., hosts of, in Canada, **55**.
Ixodes eichhorni, sp. n., on man in New Guinea, **55**.
Ixodes eudyptidis, on penguins in New Zealand, **55**.
Ixodes granulatus, hosts of, in India, **55**.
Ixodes hexagonus, hosts of, in Britain, **142, 194**; on weasel in Canada, **80**.
Ixodes hexagonus var. *cookei*, on dog in Canada, **80**.
Ixodes japonensis, distribution of, **55**.
Ixodes marxi, hosts of, in Canada, **80**.

Ixodes nairobiensis, sp. n., on dog in British East Africa, **55**.
Ixodes nuttalli, in Peru, **55**.
Ixodes percavatus var. *rothschildi*, on puffin in Britain, **142**.
Ixodes pratti, hosts of, in Canada, **80**.
Ixodes putus, hosts of, in Britain, **142**.
Ixodes ricinus, hosts of, in Britain, **142**; hosts of, in Canada, **80**.
Ixodes ricinus var. *gibbosus*, on goats in Asia Minor, **55**.
Ixodes tasmani, hosts of, in Australia, **55**.
Ixodes texanus, hosts of, in Canada, **80**.
Ixodes unicavatus, on *Phalacrocorax graculus* in Britain, **142**.
Ixodes vespertilionis, on *Rhinolophus ferrumequinum* in Britain, **142**.
Ixodes victoriensis, sp. n., on *Phascolomys* in Australia, **55**.
Ixodiphagus caucurtei, parasite of *Haemaphysalis* spp., **34**.
Ixodiphagus texanus, parasite of *Haemaphysalis leporis-palustris*, **34**.
Ixodoidea, monograph of, **34**.
Izal, against mange on goats, **123**.

J.

jacksoni, *Erephopsis*.
jaculum, *Herpetomonas*.
Jamaica, importance of tick-destroying birds in, **2**; malaria and mosquitos in, **90**; pellagra in, probably not due to *Simulium*, **90**; dipping against tick-borne diseases in, **160**.
jamesi, *Anopheles*.
Janthinosoma, in Guatemala, **177**.
Janthinosoma lutzi, believed to distribute eggs of *Dermatobia hominis*, **157**.
Japan, *Ixodes japonensis* in, **55**; Kedani fever and its carriers in, **52**, **68**; type of mosquito net used in, **85**; use of rat-poison to control plague in, **154**.
japonensis, *Ixodes*.
Java, parasites in the lungs of *Cynocephalus* from, **40**; relation between plague, fleas and rats in, **128**; parasitic worms in cattle in, **70**.
jejunus, *Lipeurus*.
jepsoni, *Culex*.
jeyporiensis, *Anopheles*.
johannseni, *Simulium*.
Johannsenomyia albibasis, sp. n., in Illinois, **55**.
jonesi, *Polyplax*.
jucundus, *Tabanus*.
jugraensis, *Armigeres*.

K.

Kala-azar, experiments with bedbugs and, **124**, **174**; probably not carried by *Ctenocephalus canis* and *Pulex irritans*, **49**; (see *Leishmania*).
Kamerun, measures against sleeping sickness in, **110**.
Kangaroo, *Tracheomyia macropi* infesting, in Australia, **122**.
karwari, *Anopheles*.
Kedani Fever, and its carriers in Japan, **52**, **68**.
kelloggi, *Enderleinellus*.
Kerosene, effective against bedbugs, **8**; against lice, **193**; against mange on goats, **123**; against mosquito larvae, **81**, **98**; (see Paraffin and Petroleum).
kingsleyi, *Tabanus*.
Kirkia (see *Kirkioestrus*).
Kirkioestrus blanchardi, probably a synonym of *K. surcoufi*, **22**.
Kirkioestrus minutus, in the Congo, **22**
Kirkioestrus surcoufi, in the Congo, **22**.
Kites, destroying larvae of houseflies, **93**.
kochi, *Anopheles*.

L.

lacessens, *Haematopota*.
Lachnosterna, intermediate host of *Echinorhynchus gigas*, **176**.
Laelaps, on rats in Sierra Leone, **150**.
Laelaps agilis, hosts of, in Britain, **142**.
Laelaps echidninus, **150**; on *Epimys norvegicus* in Britain, **142**.
Laelaps festinus, hosts of, in Britain, **142**.
Laelaps hilaris, hosts of, in Britain, **142**.
Laelaps pachypus, hosts of, in Britain, **142**.
laetus, *Chrysops*.
Lancasteria culicis, infesting *Stegomyia fasciata*, **163**.
laniger, *Mucidus*.
lardaria, *Polietes*.
Large Chicken Louse (see *Goniocotes gigas*).
Large Hen Louse (see *Menopon biseriatum*).
latifrons, *Lucilia*; *Sarcophaga*.
latisetosa, *Ravinia*.
latrans, *Canis*.

laverani, Tabanus.
laxifrons, Pyrellia.
leachi, Haemaphysalis.
laeve, Aponomma.
lectularius, Cimex (Acanthia).
lefanui, Forcipomyia.
Legislation, against introduction of *Hypoderma bovis* into Australia, **73**; against *Stegomyia* and yellow fever in the Gambia, **159**; against rats in Louisiana, **137**; against mosquitos in U.S.A., **95, 191**.
Leiognathus morsitans (see *Liponyssus bursa*).
Leishmania, not found in reptiles in French Equatorial Africa, **84**; varieties of, and their carriers in Peru, **63**; in man, probably not carried by *Pulex irritans*, **49**; distribution and carriers of, **102**; life-cycle of, compared with that of *Herpetomonas*, **43**; identity of canine and infantile forms of, **103**; (see Kala-Azar).
Leishmania donovani, experiments with bed-bugs and, **124, 174**; flagellate stage of, in vertebrates, **44**.
Leishmania infantum, identity of, with Mediterranean kala-azar, **103**.
Leishmania tropica, experiments with bed-bugs and, **174**; possibly conveyed mechanically by house-flies, **9**.
lenis, Mesopsylla.
lepidum, Amblyomma.
Lepisma saccharina, methods of destroying, **140**.
leporis-palustris, Haemaphysalis.
Leprosy, transmission of, by *Musca domestica*, **85**.
Leptidae, new blood-sucking species of, in Australia, **41**.
Leptocera sylvatica, in U.S.A., **107**.
Leptocimex boueti, in French Guinea, **21**.
Leptomonas, in *Cordylobia rodhaini*, **139**.
Leptopsylla adelpha, on *Mus* sp. in Arizona, **33**.
Leptopsylla musculi, in Britain, **166**; and plague, **4**.
Lepus americanus, *Ixodes* spp. on, in Canada, **55, 80**.
Lepus nigricollis, *Hyalomma aegyptium* on, in Libya, **15**.
Lepus sylvaticus, *Ixodes ricinus* on, in Canada, **80**.
Leria serrata, hibernation of, in houses, **121**.
Lesser Chicken Louse (see *Goniocotes hologaster*).
Leucomyia annulata (see *Culex*).
leucosphyrus, Anopheles.
leucostoma, Ophyra.
lewisi, Trypanosoma.
Liberia, *Haemogamasus liberiensis* on *Mus trivirgatus* in, **142**.
liberiensis, Haemogamasus.
Libya, African coast fever in cattle in, **69**; Mediterranean coast fever in, **14, 15**.
Lice, infesting sheep in Australasia, **111**; on man and animals in Britain, **178**; in Muscat, **173**; anatomy of, **183**; control of, on domestic animals, **10, 79, 91, 158, 178**; infesting fowls, **12, 13, 166, 191**; bionomics and control of, on man, **7, 13, 17, 24, 25, 35, 50, 51, 53, 57, 83, 87, 104, 133, 135, 158, 177, 192**; on rats, **150**; and exanthematous typhus, **17, 135, 153**; conveying recurrent fever, **134**; potential carriers of plague, **130**; experiments with hydrocyanic acid against, **135, 155, 175**; effects of temperature on, **57, 83, 87**; (see *Pediculus*, etc.).
Limatus durhami, breeding-places of, in Trinidad, **6**.
limbatum, Simulium.
Lime, ineffective against mites on fowls, **53**; in formula for dip against scabies, **148**.
Lime-Sulphur, against lice on domestic animals, **91**.
Lime-Sulphur Dip, chemistry of, **187, 188**.
Limnophora semiargentata, sp. n., from Ruwenzori, **125**.
Limnophora septemnotata, in houses in Britain, **87, 102, 121**.
lindesayi, Anopheles.
linealis, Pseudohowardina.
lineata, Hypoderma.
lineatopennis, Banksinella.
lineatus, Tabanus.
Linognathus angulatus, on *Cephalophus natalensis* in South Africa, **120**.
Linognathus fahrenholzi, on *Cervicapra fulvorufula* in South Africa, **121**.
Lipeurus anseris, on geese, **13**.
Lipeurus baculus, on pigeons, **13**.
Lipeurus heterographus, on *Gallus domesticus*, **13**.
Lipeurus jejunus, on geese, **13**.
Lipeurus polytrapezius, on turkeys, **13**.
Lipeurus squalidus, on geese, **13**.
Lipeurus variabilis, on *Gallus domesticus*, **13**.
Liponyssus bursa, on fowls in Australia, **159**.
Liquid "C," effective against flies in warfare, **92**.

listoni, Anopheles (*Myzomyia*).
Listrophorus gibbus, on rabbits in U.S.A., **96**.
lividicolor, Lynchia.
Lizards, experimentally infected with insect flagellates, **103**; destroying mosquitos in Sierra Leone, **163**.
lloydi, Villa.
locuples, Amphipsylla contigua.
Loemopsylla cheopis (see *Xenopsylla*).
Lonchaea vaginalis, in houses in Britain, **144**.
longicaudatus, Putorius.
longicornis, Chrysops; *Spaniopsis*.
longior var. *castellanii, Tyroglyphus*.
longipalpis, Glossina.
longispinus, Megarthroglossus.
Loogas-Sulphur Dip, chemistry of, **188**.
Lophoceratomyia, in Queensland, **183**.
Louisiana, legislation against rats in, **137**.
loxodontis, Cobboldia.
Lucilia, **51**; traps for, in Egypt, **142**.
Lucilia argyrocephala, causing myiasis in man, **21**.
Lucilia caesar, bionomics of, in Britain, **143**; in Gallipoli, **92**; in Salonica, **179**; parasitised by *Nasonia brevicornis* in U.S.A., **2**; trapped with milk-baits in U.S.A., **5**; in relation to disease, **46**; experiments in the control of, **167, 169**.
Lucilia dispar (see *Phormia sordida*).
Lucilia latifrons, on the battlefield, **18**.
Lucilia sericata, bionomics of in Britain, **143**; in Queensland, **183**; bionomics of, in U.S.A., **1**; trapped with milk-baits in U.S.A., **5**; causing myiasis, **88**; effect of eucalyptus oil on, **71**.
Lucilia viridiceps, placed in genus *Pseudorthellia*, **159**.
lucorum, Mydaea.
ludlowi, Anopheles.
lukisi, Anopheles.
lumbricoides, Ascaris.
lunulatus, Rhipicephalus.
luridum, Trinoton.
luteocephala, Stegomyia.
luteola, Auchmeromyia.
luteolateralis, Banksinella.
lutescens, Paratricyclea.
lutzi, Janthinosoma.
Lynchia capensis, infecting pigeons with *Haemoproteus columbae*, **189**.
Lynchia lividicolor, on pigeons in Brazil, **137**.
Lynchia maura, on ring-dove in Nyasaland, **171**; distribution of, on pigeons, **107**.
Lynx, *Ctenocephalus felis* on, in Persia, **151**.
Lynx canadensis, *Ceratophyllus ignotus* on, in Alberta, **33**.
Lyperosia, possibly conveying trypanosomiasis in Accra, **42**.
Lyperosia irritans, dispersal of, by man, **96**.
Lyperosia minuta, on game in the Belgian Congo, **68**.
Lyperosia punctigera, on game in the Belgian Congo, **68**.

M.

Macacus rhesus, effect of bite of *Ornithodorus coriaceus* on, **119**; *Pneumotuber macaci* in the lungs of, **40**.
macellaria, Chrysomyia (*Cochliomyia*).
macfarlanei, Tabanus.
Macleaya tremula, in Australia, **11, 183**.
macquarti, Azelaria.
macrocephalus, Haematopinus (see *H. asini*).
Macrodactylus subspinosus, poisonous effects of, on fowls, **26**.
macrophthalmus, Ceratophyllus.
macropi, Tracheomyia (*Oestrus*).
macrostoma, Spiroptera.
maculata, Graphomyia; *Hippobosca*.
maculator, Cephalomyia (*Oestrus*) (see *Cephalopsis titillator*).
maculatus, Anopheles; *Dasyurus*; *Isometrus*.
maculipalpis, Anopheles.
maculipennis, Anopheles.
maculisquama, Pyrellia.
maculosa, Stygeromyia.
Madagascar, *Dermatophilus penetrans* in, **5**; *Eretmapodites quinquevittatus* in, **120**; use of fish against mosquito larvae in, **195**.
Madeira, a new *Ochlerotatus* from, **64**.
magnicornis, Gastrophilus.
magnifica, Wohlfartia (*Sarcophaga*).
major, Pseudoculicoides.
Malaria, and its control in Africa, **154**; chiefly carried by *Anopheles funestus* in French Equatorial Africa, **84**; in Portugese East Africa, **130**; in Algeria, **190**; in China, **131**; in domestic animals in Egypt, **192**; in France, **20, 139**; in New Guinea, **127**; in India, **74, 86**; in Italy, **19**; in Jamaica, **90**; distribution of, in Malay States, **54, 66**; in

Mexico, 59; not carried by Anophelines in Minnesota, 152; in Morocco, 85; in Muscat, 172; history of measures against, in Panama, 97–99; in Sierra Leone, 44, 150; in Sumatra, 130; in Trinidad, 69; in U.S.A., 53, 76, 77, 90, 92; experiments with *Anopheles* spp. and, in U.S.A., 53, 92, 136, 152, 175; list of Anophelines transmitting, 74, 104; and mosquitos, 19, 44, 53, 54, 59, 66, 69, 73, 74, 76, 77, 84, 85, 86, 90, 92, 97, 104, 124, 127, 130, 131, 134, 136, 139, 152, 154, 172, 175, 190; measures against, 77, 97–99, 104, 154, 173.
malariae, Plasmodium.
Malay States, key to Anopheline larvae of, 54; new *Haematopota* from, 65; mosquitos and malaria in, 54, 66, 120.
malayensis, Haematopota.
malefactor, Anopheles.
Man, infested with *Geophilus carpophagus* in France, 102; serum of, fatal to *Leishmania donovani*, 174; mites attacking, 68, 159; attacked by *Pericoma townsvillensis* in Queensland, 30; *Pulex irritans* on, 4; attacked by *Simulium sanguineum* in Colombia, seldom attacked by *Simulium venustum* in U.S.A., 81; ticks infesting, 55, 80, 119, 142, 154; *Triphleps insidiosus* attacking, in Illinois, 107; relation between *Trypanosoma cruzi* and, in Brazil, 38; attacked by *Wohlfartia magnifica* in Russia, 88; dissemination of disease-carrying insects by, 96, 137; susceptible to Rocky Mountain spotted fever, 77; effect of nitrobenzine on, 79.
mandarinus, Tabanus.
manducator, Alysia.
Mange, measures against, on goats in Ceylon, 123; control of, on horses, 70, 126, 165, 178; on dogs and sheep, caused by *Sarcoptes* spp., 58.
manicata, Fannia.
Mansonia (see *Taeniorhynchus*).
Mansonioides africanus, in Natal, 120; in Nigeria, 66.
Mansonioides annuliferus, in Sumatra, 23.
Mansonioides annulipes, in Sumatra, 23.
Mansonioides uniformis, carrying filariasis in Africa, 120; in Australia, 11, 60; in Nigeria, 66, 112; in Sierra Leone, 45, 150; in Sumatra, 23.
mantelli, Apteryx.
Mantids, destroying mosquitos in Sierra Leone, 163.
Margaropus, thick-tailed form of *Leishmania* not produced in, 174; probably transmitting piroplasmosis in the Gold Coast, 42.
Margaropus annulatus (Texas Fever Tick), 176; on dogs, 58; *Piroplasma bigeminum* in, 64; and diseases of cattle in Brazil, 69; on cattle in Egypt, 7, 192; not found in Italian Somaliland, 70; importance of birds destroying, in Jamaica, 2; in Nigeria, 66, 113; bionomics and control of, in U.S.A., 2; carrying Egyptian fever, 7; destroyed by nitrobenzine, 79.
Margaropus annulatus decoloratus, carrying piroplasmosis of cattle, 46, 64.
Margaropus annulatus microplus, and piroplasmosis in Brazil, 83.
Margaropus australis, in Northern Australia, 8, 11; on cattle in Egypt, 192; in Sierra Leone, 45.
Margaropus caudatus, on domestic animals in Guam, 191.
marginipennis, Spaniopsis.
marmoreum, Amblyomma.
marmorosus, Tabanus.
marocanus, Culex annulatus.
marxi, Ixodes.
mastersi, Tabanus.
maura, Lynchia.
mauritianus, Anopheles.
mayeti, Reduvius.
meditabunda, Mydaea.
Mediterranean, sand-fly fever and *Phlebotomus papatasii* in, 57.
megacephala, Pycnosoma (see *P. bezzianum*).
Megarhinus, in Guatemala, 177.
Megarhinus septentrionalis, in North Carolina, 136.
Megarhinus trinidadensis, breeding-places of, in Trinidad, 69.
Megarthroglossus bisetis, sp. n., on *Neotoma* in New Mexico, 33.
Megarthroglossus longispinus, hosts of, in Canada, 33.
Megarthroglossus procus, sp. n. hosts of, in British Columbia, 33.
Megarthroglossus sicamus, sp. n., on *Canis latrans* in British Columbia, 33.
megista, Triatoma.
megnini, Ornithodorus.
meigeni, Wohlfartia.
Melanoconion, 37.
melanura, Sarcophaga.
meleagridis, Pseudolfersia.
Meleagris gallopavo, Pseudolfersia meleagridis on, in Peru, 137.

Melittobia acasta, hyper-parasite of house-flies in Britain, **146**.
Melolontha, intermediate host of *Echinorhynchus gigas*, **176**.
melophagi, *Crithidia*.
Melophagus ovinus, experimentally infecting rats with *Crithidia melophagi*, **103**; destroyed by nitrobenzine on sheep, **79**.
Menopon biseriatum, on fowls and pigeons in U.S.A., **13**, **166**.
Menopon pallidum, on fowls in Guam, **191**; on fowls and pigeons in U.S.A., **13**, **166**.
Menopon phaeostomum, on peafowls, **13**.
Menthol, effective against lice and fleas, **8**.
Mephistus, *Anomiopsyllus nudatus* on, in Arizona, **33**.
Mercuric Chloride, too expensive for use against house-fly larvae, **5**.
Mercury Perchloride, against lice on horses, **178**; (see also Corrosive Sublimate).
Mermis, parasitising *Simulium*, **82**.
Mesopotamia, mosquitos from, **172**.
mesopotamiae, *Anopheles sinensis*.
Mesopsylla hebes, sp. n., on *Arvicola terrestris scythicus* in Turkestan, **32**.
Mesopsylla lenis, sp. n., hosts of, in Turkestan, **32**.
Metacresol, effect of, on animal parasites, **79**.
metallica, *Stegomyia*.
metallicus, *Taeniorhynchus*.
Metathrombidium poriceps, attacking man in France, **68**.
meteorica, *Hydrotaea*.
Meteorological Conditions, effects of, on fleas, **4**; on house-flies, **62**; on malaria and mosquitos, **173**; on ticks in U.S.A., **3**.
Mexico, nest of *Coenotele gregalis* used as fly-trap in, **9**; *Dermatophilus penetrans* in, **5**; mosquitos and malaria in, **59**; *Pseudolfersia vulturis* on vultures in, **138**.
micans, *Morellia*; *Stomatoceras*.
Mice, fleas on, in New South Wales, **181**; infected with *Herpetomonas ctenocephali* by fleas, **103**; *Microtrombidium akamushi* on, in Japan, **68**; effect of bite of *Ornithodorus coriaceus* on, **119**; apparently immune to Rocky Mountain spotted fever, **77**; (see *Mus*).
microcephalus, *Haematopinus* (see *H. pedalis*).
microchir, *Antarctophthirius*.
Microchrysa polita, in houses in Britain, **144**.
Microlynchia pusilla, on pigeons in Brazil, **137**.
microphthalmus, *Spalax*.
microplus, *Margaropus annulatus*.
Micropus affinis, *Dermanyssus* spp. on, in French Guinea, **21**.
Microtrombidium akamushi, transmitting Kedani fever in Japan, **68**.
Microtrombidium autumnale (Harvest Bug), attacking man in Britain, **68**.
Microtus, *Amphipsylla schelkovnikovi* on, in Caucasia, **151**.
Microtus eversmanni, *Amphipsylla contigua locuples* on, in Turkestan, **32**.
Microtus ilaeus, *Amphipsylla contigua locuples* on, in Turkestan, **32**.
Microtus obscurus, *Amphipsylla contigua locuples* on, in Turkestan, **32**.
Microtus orcadensis, mites on, in Britain, **142**.
miles, *Tabanus*.
milnei, *Culicoides*.
milsoni, *Ochlerotatus* (*Culicada*).
Mimeteomyia atripes, in New South Wales, **11**; in Northern Australia, **11**.
Mimeteomyia hilli, in Northern Australia, **11**, **183**.
Mimeteomyia quasiornata, sp. n., in Queensland, **11**.
Mimomyia hispida, breeding-places of, in West Africa, **112**.
Mimomyia plumosa, breeding-places of, in West Africa, **112**.
minima, *Diatomineura*.
minimus, *Anopheles*.
Minnesota, Anophelines not carrying malaria in, **152**.
minuta, *Lyperosia*.
minutus, *Kirkioestrus*; *Ochlerotatus*; *Phlebotomus*.
Mites, control of, on sheep and goats in South Africa, **184–187**; of North America, **96**; on fowls in Australia, **159**; list of parasitic, on birds and mammals in Britain, **141**; infesting birds in French Guinea, **21**; possible carriers of Kedani fever in Sumatra, **52**; on domestic animals in U.S.A., **13**, **58**, **96**; and their control on fowls, **13**, **53**, **79**, **166**, **191**; measures against, on horses, **126**, **178**; attacking man, **68**; on rats, **150**.
mlokosiewiczi, *Chrysops*.
molestus, *Chrysops*.
Monedula signata, predaceous on *Simulium*, **82**.
Monkeys, inoculated with Indian leishmaniasis, **103**; effect of bite of *Ornithodorus coriaceus* on,

119; *Paraplasma flavigenum* in blood of, **66**; *Pneumotuber macaci* in the lungs of, **40**; susceptible to Rocky Mountain spotted fever, **77**.
Monomorium pharaonis, destroying mosquitos in Sierra Leone, **163**.
Montana, dispersal of house-flies in towns in, **78**.
Moose, *Dermacentor albipictus* on, in Canada, **80**.
Morellia hortorum, bionomics of, in Britain, **145**.
Morellia micans, trapped with milk-baits in U.S.A., **5**.
Morocco, mosquitos of, **85**; Oestrids infesting horses in, **164**; distribution of *Stegomyia fasciata* in, **40**; danger of introduction of yellow fever into, **40**.
morsitans, *Glossina*; *Leiognathus* (see *Liponyssus bursa*).
mortuorum, *Cynomyia*.
Mosquito Larvae, breeding-places of, **28, 44, 45, 61, 69, 72, 74, 95, 97, 118, 123, 124, 130, 131, 136, 148, 156, 159, 160–164, 165, 170, 173, 175, 182, 190, 191**; bionomics of, in West Africa, **28, 81, 111, 161–164, 165**; key to Malayan, **54**; natural enemies of, **44, 69, 99, 120, 137, 163, 170, 195**; fish destroying, **44, 69, 99, 195**; drainage measures against, **93, 95**; oiling against, **95, 98, 152, 170**; deriving air from water-plants, **170, 177**; experiments with naphthaline against, **81, 164**; effect of salt solution on, **91**; formula for larvicide against, **98**; methods of transporting, **49**.
Mosquitos, in Tropical Africa, **28, 44, 45, 66, 81, 84, 112, 130, 150, 161–164, 165**; in Algeria, **190**; in Australia, **60, 72, 90, 182, 183, 196**; key to malaria-carrying species of, in North Borneo, **73**; in Brazil, **37**; in California, **159**; in Canada, **122**; list of, from North Carolina, **135**; in China, **131**; legislation against, in Connecticut, **95**; list of, from Durban, **120**; in Fiji, **41**; in France, **101, 139**; in Germany, **16**; in New Guinea, **127**; in Hong Kong, **39**; in India, **74, 86, 91, 118, 124**; in Italy, **19**; in Jamaica, **90**; type of net used against, in Japan, **85**; in Malay States, **54, 66**; in Mexico, **59**; in Morocco, **40, 85**; in Muscat, **172**; history of control of, in Panama, **97–99**; in Principe, **49**; list of, from Queensland, **10, 11**; in the Sahara, **156**; natural enemies of, in Sierra Leone, **163**; in Sumatra, **23, 130**; in Trinidad, **69**; in U.S.A., **53, 61, 76, 90, 92, 95, 123, 136, 152, 170, 175, 180, 191**; classification of, **16, 64, 73, 74, 172, 175**; an early record of, as carriers of disease, **16**; possible carriers of Biskra boil, **9**; relation of, to dengue, **73, 148, 149, 196**; and malaria, **19, 44, 53, 54, 59, 66, 69, 73, 76, 77, 84, 85, 86, 90, 92, 97, 104, 124, 127, 130, 131, 134, 136, 139, 152, 154, 172, 175, 190**; experiments with malaria and, **53, 92, 136, 152, 175**; and yellow fever in the tropics, **12, 59, 66, 99, 110, 135, 148, 149, 150, 159, 165**; measures against, **59, 77, 99, 176**; control of, in salt marshes, **6**; measures against, on ships, **59, 131**; experiments with hydrocyanic acid against, **155, 175**; formulae for protective fluids against, **61**; destruction of, by fumigation with creolin, **134**; effect of pyrethrum on, **61**; methods of trapping, **160**; legislation against, in U.S.A., **191**.
mossmani, *Culex*.
moubata, *Ornithodorus*.
Mucidus alternans, in Australia, **11, 60**.
Mucidus laniger, in Sumatra, **23**.
Mückenfluid, formula for, against mosquitos, **61**.
Mules, infested with *Gastrophilus magnicornis*, sp. n., in Eritrea, **156**; *Gastrophilus* spp. in, in New Guinea, **22**; *Hyalomma aegyptium* on, in Libya, **15**; *Simulium placidum* on, in Trinidad, **30**; attacked by *Simulium venustum* in U.S.A., **81**; partial immunity of, to trypanosomiasis, **42, 48**.
muris, *Dermanyssus*.
murphyi, *Hippocentrum*.
Mus, *Phalacropsylla paradisea* on, in Arizona, **33**; *Megarthroglossus longispinus* on, in Canada, **33**; fleas on, in U.S.A., **33**; (see Mice and Rats).
Mus coucha, *Hoplopleura intermedia*, sp. n., on, in S. Africa, **120, 121**.
Mus decumanus, in Shanghai, **61**.
Mus musculus, mites on, in Britain, **142**.
Mus rattus, in Shanghai, **61**; distribution of subspecies of, in Java, **129**; (see *Epimys*).

Mus trivirgatus, *Haemogamasus liberiensis*, sp. n., on, in Liberia, 142.
Musca, anatomical characters of, 74; specific differences in the genus, 172; parasitised by *Stenomalus muscarum* and *Spalangia*, 121.
Musca autumnalis, 159; bionomics of, in Britain, 109, 144, 145.
Musca corvina (see *M. autumnalis*).
Musca domestica, 51; in South Africa, 80; said to be controlled by ants in Northern Australia, 73; in houses in Britain, 102, 144; in British Guiana, 194; in Egypt, 142; natural enemies of, in Fiji, 41; in Gallipoli, 92; in Salonica, 179; in U.S.A., 62; on battlefields, 18; traps for, 5, 106, 142; bionomics and control of, 20, 62, 80, 106, 108, 167–169, 194; in relation to disease, 45; transmission of leprosy by, 85; dispersal of, by man, 96: dispersion of, in towns, 147; (see also House-flies).
muscae, *Habronema* (see *Spiroptera macrostoma*).
muscarum, *Stenomalus*.
Muscat, mosquitos and malaria in, 172.
Muscina assimilis, trapped with milk-baits in U.S.A., 5.
Muscina heterochaeta (see *Passeromyia*).
Muscina pabulorum, bionomics of, in Britain, 143.
Muscina stabulans, bionomics of, in Britain, 87, 109, 121, 143; in Gallipoli, 92; trapped with milk-baits in U.S.A., 5; on battlefields, 17; dispersal of, by man, 96.
musculi, *Leptopsylla*.
Mustela, *Ceratophyllus* spp. on, in Canada, 33.
Mustela erminea, *Ixodes hexagonus* on, in Britain, 142; fleas on, in Turkestan, 32.
Mustela nivalis, parasites of, in Britain, 141, 142; *Amphipsylla contigua locuples* on, in Turkestan, 32.
Mustela pallida, *Amphipsylla contigua locuples* on, in Turkestan, 32.
mutans, *Theileria*.
Mutilla benefactrix, sp. n., parasite of *Glossina morsitans* in Nyasaland, 113, 116.
Mutilla glossinae, parasite of *Glossina morsitans* in Rhodesia and Nyasaland, 28, 65, 113, 116, 117, 122.
Mydaea, in Eritrea, 156.
Mydaea impuncta, in houses in Britain, 144.
Mydaea lucorum, bionomics of, in Britain, 143.
Mydaea meditabunda, in houses in Britain, 144.
Mydaea obscurata, in houses in Britain, 144.
Mydaea uliginosa, in houses in Britain, 144.
Mydaca urbana, in houses in Britain, 144.
Myiasis, bionomics of flies causing, in Africa, 138; in horses in Morocco, 164; flies causing, in Panama, 105; caused by *Wohlfartia magnifica* in Russia, 88; flies causing, in French Guinea, 21; flies causing, in dogs, 58.
Myonyssus decumani, on *Mus musculus* in Britain, 142.
Myonyssus gigas, hosts of, in Britain, 142.
Myxosporidia, parasitising *Simulium*, 82.
Myzomyia (see *Anopheles*).
myzomyifacies, *Pyretophorus* (see *Anopheles turkhudi*).
Myzorhynchus (see *Anopheles*).

N.

nairobiensis, *Ixodes*.
Naphthaline, in dips for protecting sheep from blow-flies, 71; against fleas, 35; against lice, 8, 25, 53, 133, 134, 135, 153, 193; against mites, 53; experiments with, on early stages of mosquitos, 81, 164.
nasalis, *Gastrophilus*.
Nasonia brevicornis, parasite of maggot-flies in Australia, 179; parasite of *Lucilia* and *Phormia* in U.S.A., 2.
Natal, mosquitos from, 120.
neavei, *Simulium*.
nebulosa, *Culiciomyia*.
Nemopoda cylindrica, bionomics of, in Britain, 143.
Neocellia (see *Anopheles*).
Neoceratopogon bellus, in Illinois, 55.
Neocuterebra squamosa, parasite of the African elephant, 40.
Neohaematopinus antennatus var. *semifasciatus*, on *Sciurus douglasi albolimbatus* in North America, 177.
Neomacleaya australis, sp. n., in Queensland, 11.
Neopsylla faceta, sp. n., on *Sciurus hudsonicus* in U.S.A., 33.
Neopsylla inopina, sp. n., on rodents in Canada, 33.

Neopsylla secura, sp. n., on *Epimys* spp. in India, **33**.

Neopsylla spinea, sp. n., hosts of, in Rumania, **33**.

Neopsylla stevensi, sp. n., on *Epimys fulvescens* in India, **33**.

Neopsylla testor, sp. n., in U.S.A., **33**.

Neotabanus comitans, in Brazil, **36**.

Neotabanus ochrophilus, in Brazil, **36**.

Neotabanus triangulum, in Brazil, **36**.

Neotoma, *Megarthroglossus bisetis*, sp. n., on, in New Mexico, **33**.

Neotoma cinerea, *Catallagia charlottensis* on, in British Columbia, **33**.

Neotoma fuscipes, *Triatoma protracta* in nest of, **181**.

Nepa cinerea, experimental transmission of flagellates of, **103**; infested with *Herpetomonas jaculum*, **44**.

New England, *Phormia azurea* in, **78**.

New Guinea, mosquitos and malaria in, **127**, **135**; ticks in, **55**.

New Jersey, mosquitos in, **175**.

New Mexico, *Megarthroglossus bisetis* on *Neotoma* in, **33**.

New South Wales, experiments with dengue and mosquitos in, **148**, **196**; fleas found on rats in, **181**; new blood-sucking Leptids from, **41**; mosquitos and Tabanids from, **182**.

New Zealand, ticks in, **55**.

Nicotine, in formula for treating mange in horses, **70**; in formula for dip against scabies, **148**.

nidi, *Haemogamasus*.

nidicola, *Corticaria*.

Nigeria, new Calliphorine flies from, **126**; blood-sucking organisms and disease in, **66**, **112**; mosquitos in, **120**; *Stegomyia fasciata* and yellow-fever in, **148**, **149**.

nigeriense, *Trypanosoma*.

nigerrimus, *Anopheles* (see *A. sinensis*).

nigra, *Olfersia*; *Ophyra*; *Stomoxys*.

nigricephalus, *Ochlerotatus*.

nigripes, *Anopheles* (*Coelodiazesis*); *Uranotaenia*.

nigritarsis, *Tabanus*.

nigroviolacea, *Paratricyclea*.

nilgiricus, *Culex*.

Niptus hololeucus, in casein, in Scotland, **179**.

Nitrobenzine, effect of, on animal parasites, **79**.

Nitzschia pulicaris, period of incubation of, on fowls, **13**.

nivipes, *Uranotaenia* (*Anisocheleomyia*).

nocturnus, *Culex*.

nodosus, *Chelifer*.

normanensis, *Culex*.

Norway, household pests in, **180**.

Nose Fly (see *Gastrophilus nasalis*).

Nosema pulicis, sp. n., parasite of *Ctenocephalus felis*, **125**.

Notonectids, predaceous on mosquito larvae, **73**.

notoscriptus, *Ochlerotatus* (*Scutomyia*).

nudatus, *Anomiopsyllus*.

nudus, *Cytodites*; *Ptilonyssus*.

Numenius arquatus, ticks on, in Britain, **142**.

nurus, *Sarcophaga*.

nuttalli, *Ixodes*.

Nuttallia decumani, sp. n., in rats in the Gold Coast, **42**.

Nuttallia equi, causing biliary fever in horses, **64**.

Nyasaland, new Calliphorine flies from, **126**; insect-borne diseases in, **170**, **171**; bionomics and control of *Glossina morsitans* in, **18**, **28–30**, **65**, **113**, **116**; sleeping sickness in, **18**; trypanosomiasis of cattle in, **19**; *Passeromyia heterochaeta* in, **138**.

Nyssorhynchus (see *Anopheles*).

O.

obliterata, *Adalia*.

obscurata, *Mydaea*.

obscurehirtus, *Tabanus*.

obscurissimus, *Tabanus*.

occidentalis, *Anopheles*; *Ochlerotatus* (*Culex*).

oceaniae, *Calliphora* (see *Anastellorhina augur*).

Ochlerotatus, in West Africa, **165**.

Ochlerotatus abfitchi, breeding-places of, in U.S.A., **170**.

Ochlerotatus alboannulatus, breeding-places of, in New South Wales, **182**.

Ochlerotatus albocephalus, distribution of, in Africa, **120**.

Ochlerotatus annulatus, in Queensland, **60**.

Ochlerotatus annulipes, in Australia, **11**, **182**.

Ochlerotatus annulirostris, in Northern Australia, **8**.

Ochlerotatus apicoannulatus, bionomics of, in Sierra Leone, **44**, **163**.

Ochlerotatus argenteo-punctatus, in Nigeria, **66**.

Ochlerotatus aurifer, breeding-places of, in U.S.A., **170**.

Ochlerotatus australis, in New South Wales, **182**.

Ochlerotatus bevisi, in Natal, **120**.
Ochlerotatus caliginosus, in Nigeria and Sierra Leone, **66**, **150**.
Ochlerotatus canadensis, breeding-places of, in U.S.A., **61**, **136**, **170**.
Ochlerotatus (*Aëdes*) *cantator*, breeding in salt marshes in U.S.A., **6**, **123**.
Ochlerotatus cumminsi, in Nigeria, **66**, **112**.
Ochlerotatus cumpstoni, breeding-places of, in New South Wales, **182**; in Sydney, **11**.
Ochlerotatus dentatus, in Natal, **120**.
Ochlerotatus domesticus, in Nigeria, **66**.
Ochlerotatus durbanensis, distribution of, in Africa, **120**.
Ochlerotatus eatoni, sp. n., from Madeira, **64**.
Ochlerotatus gibsoni, in Northern Australia, **8**.
Ochlerotatus impiger, breeding-places of, in U.S.A., **170**.
Ochlerotatus irritans, breeding-places of, in West Africa, **28**, **66**, **81**, **112**.
Ochlerotatus milsoni, sp. n., breeding places of, in New South Wales, **11**, **182**.
Ochlerotatus minutus, breeding-places of, in Sierra Leone, **44**, **45**, **163**.
Ochlerotatus nigricephalus, bionomics of, in West Africa, **45**, **66**, **150**.
Ochlerotatus notoscriptus, in Australia, **11**, **60**, **182**, **183**.
Ochlerotatus occidentalis, in Australia, **11**, **182**.
Ochlerotatus ochraceus, in Nigeria, **66**.
Ochlerotatus oreophilus, sp. n., from India, **64**.
Ochlerotatus ornatus, breeding-places of, in Germany, **16**.
Ochlerotatus paludis, in Northern Australia, **11**, **60**.
Ochlerotatus pampangensis, in Northern Australia, **11**.
Ochlerotatus pseudotaeniatus, anatomy of, **74**.
Ochlerotatus punctothoracis, in Nigeria and the Gold Coast, **66**, **81**.
Ochlerotatus quasiunivittatus, in Natal, **120**.
Ochlerotatus rubrithorax, in New South Wales, **182**.
Ochlerotatus sagax, breeding-places of, in New South Wales, **182**.
Ochlerotatus simulans, breeding-places of, in Sierra Leone, **44**.
Ochlerotatus (*Aëdes*) *sollicitans*, breeding in salt marshes in U.S.A., **6**, **95**, **123**.
Ochlerotatus subcantans, breeding-places of, in U.S.A., **170**.
Ochlerotatus sudanensis, breeding-places of, in West Africa, **112**.
Ochlerotatus sylvestris, breeding-places of, in U.S.A., **61**, **136**, **170**.
Ochlerotatus (*Aëdes*) *taeniorhynchus*, breeding-places of, in California, **159**.
Ochlerotatus theobaldi, attacking man in New South Wales, **182**.
Ochlerotatus triseriatus, breeding-places of, in U.S.A., **136**, **170**.
Ochlerotatus trivittatus, breeding-places of, in U.S.A., **170**.
Ochlerotatus vigilax, in Australia, **8**, **11**, **60**, **72**, **182**, **183**.
ochraceus, *Ochlerotatus*.
ochrophilus Neotabanus.
oculatus, *Rhipicephalus* ; *Tabanus*.
Oecothea fenestralis, in houses in Britain, **102**.
Oestrids, in the Belgian Congo, **22**, **40**; infesting domestic animals in Canada, **194**, **195**; infesting horses in Morocco, **164**; infesting camels in the Sahara, **157**; effect of carbon bisulphide on larvae of, **62**.
Oestrus bertrandi, probably identical with *O. variolosus*, **22**.
Oestrus macropi (see *Tracheomyia*).
Oestrus maculator (see *Cephalopsis titillator*).
Oestrus ovis, in Queensland, **183**; probably not the cause of staggers in sheep, **10**.
Oestrus variolosus, widely distributed in Africa, **22**.
Oils, for destroying house-fly larvae, **93**, **168**; use of, against mosquito larvae, **81**, **95**, **98**, **152**, **164**, **170**.
olens, *Helomyza*.
Olfersia albipennis, on birds in U.S.A., **169**.
Olfersia americana, on birds in U.S.A., **169**.
Olfersia angustifrons, on birds in U.S.A., **169**.
Olfersia botaurinorum, sp. n., on birds in U.S.A., **169**.
Olfersia capensis (see *Lynchia*).
Olfersia fusca, on birds in Brazil, **138**.
Olfersia holoptera, sp. n., on birds in Brazil, **138**.
Olfersia intertropica, on birds in U.S.A., **169**.
Olfersia nigra, on swallows in Brazil, **138**.
Olfersia palustris, sp. n., on birds in Brazil, **137**.
Olfersia raptatorum, sp. n., on birds in Brazil, **138**.
Olfersia scutellaris, sp. n., on birds in U.S.A., **169**.

Olfersia wolcotti, sp. n., on birds in U.S.A., **169.**

omega, *Stomoxys.*

Onchocerca gibsoni, on cattle in Northern Australia, **8**; infesting *Bos indicus* in the Malay States, **70.**

Onchocerca gutturosa, infesting *Bos taurus* in Northern Africa, **70.**

Onchocerca indica, infesting *Bos indicus* in India, **70.**

Onesia cognata, bionomics of, in Britain, **145.**

Onthophagus spp., *Gongylonema scutatum* found in, **63.**

opaca, *Trupheoneura.*

opacus, *Phanurus.*

Ophyra leucostoma, bionomics of, in Britain, **109, 143**; trapped with milk-baits in U.S.A., **5.**

Ophyra nigra, in Queensland, **183.**

orbitale, *Simulium.*

oreophilus, *Ochlerotatus.*

orientalis, *Blatta* (*Periplaneta*).

ornatus, *Ochlerotatus* (*Aëdes*); *Uranotaenia.*

Ornithoctona erythrocephala, on birds in Brazil, **138.**

Ornithodorus, Uta probably not carried by, in Peru, **63.**

Ornithodorus coriaceus, bionomics of, in California, **119.**

Ornithodorus megnini, on jack rabbits in Canada, **80.**

Ornithodorus moubata, **131**; transmitting relapsing fever in Africa, **64, 119**; in Italian Somaliland, **70**; failure to infect with leishmaniasis, **103**; a possible carrier of *Trypanosoma rhodesiense*, **44**; associated with wart-hogs, **44, 102.**

Ornithodorus reticulatus (see *O. talaje*).

Ornithodorus savignyi, in India, **91**; in Italian Somaliland, **70.**

Ornithodorus talaje, on horses in Chile, **177.**

Ornithodorus turicata, **63.**

Ornithoica confluens, on birds in Brazil, **138.**

Ornithomusca victoria, sp. n., from nest of *Pardalotus* in Victoria, **159.**

Ornithomyia avicularia, on ptarmigan in Norway, **180.**

Ornithomyia buteonis, on birds in U.S.A., **169.**

Ornithomyia costaricensis, sp. n., on birds in U.S.A., **169.**

Ornithomyia pirangae, sp. n., on birds in U.S.A., **169.**

Orthetrum chrysostigma, predaceous on *Glossina morsitans* in Nyasaland, **28.**

Orthocresol, effect of, on animal parasites, **79.**

Orthopodomyia signifer, breeding-places of, in North Carolina, **136.**

Orycteropus, infested with *Choeromyia* spp. in Senegal, **101.**

otomydis, *Polyplax.*

Otomys irroratus, *Polyplax otomydis* on, in Zululand, **120.**

Otospermophilus beecheyi (see *Citellus*).

Otter, *Ixodes hexagonus* on, in England, **194.**

oudemansi, *Haemogamasus.*

ovillus, *Haematopinus.*

ovinus, *Melophagus.*

ovis, *Oestrus*; *Psoroptes communis*; *Sarcoptes scabiei*; *Theileria.*

ovivorus, *Phanurus.*

Owls, *Ceratophyllus columbae* on, in Caucasia, **151.**

Oxyuris vermicularis, infesting man in British East Africa, **54.**

P.

pabulorum, *Muscina.*

Pacific, Anoplura infesting sea-lions in, **196.**

pacificus, *Culex.*

pachypus, *Laelaps.*

Paederus crebripunctatus, causing dermatitis in East Africa, **167.**

Paederus columbinus, causing dermatitis in Brazil, **15, 51.**

Paederus fuscipes, in Astrachan, **51.**

Pajaroello Tick (see *Ornithodorus coriaceus*).

Palestine, *Culex geniculatus* in, **156.**

pallida, *Probezzia.*

pallidipes, *Glossina.*

pallidocephalus, *Culex.*

pallidum, *Menopon.*

palpalis, *Glossina.*

Palpomyia polysticta, **118.**

paludis, *Ochlerotatus* (*Culex*, *Culicelsa*).

palustris, *Olfersia.*

pampangensis, *Ochlerotatus* (*Reedomyia*).

Panama, anti-mosquito work in, **97–99, 176**; flies causing myiasis in, **105.**

Panama Canal, effect of opening of, on spread of yellow fever, **59.**

Pangonia clavata, in New South Wales, **182.**

papatasii, *Phlebotomus.*

par, *Tabanus.*

Paracalliphora, new generic name proposed for *Calliphora oceaniae*, **122.**

Paracresol, effect of, on animal parasites, **79.**

Paradichlorobenzine, effect of, on animal parasites, **79**.
paradisea, Phalacropsylla.
paradoxus, Echestypus.
paraensis, Culicoides.
Paraffin, ineffective against bedbugs, **86**; retarding oxidation of arsenical dips, **3**; (see Kerosene and Petroleum).
paraguayense, Simulium.
Paraplasma flavigenum, in the blood of animals infected with yellow fever, **66**; not certainly the causal agent of yellow fever, **150**, **151**.
Paratricyclea caerulea, sp. n., from Ruwenzori, **126**.
Paratricyclea consors, sp. n., from Nyasaland, **126**.
Paratricyclea dubiosa, sp. n., from Nyasaland, **126**.
Paratricyclea gambiensis, sp. n., from Gambia, **126**.
Paratricyclea imitans, sp. n., distribution of, in Tropical Africa, **126**.
Paratricyclea lutescens, sp. n., from the Belgian Congo, **126**.
Paratricyclea nigroviolacea, sp. n., from Cape Town, **126**.
Paratricyclea pseudolucilia, sp. n., from the Belgian Congo, **126**.
Pardalotus, Ornithomusca victoria, sp. n., in nest of, in Australia, **149**.
Paris, *Anopheles maculipennis* captured in, **101**.
Paris Green, ineffective against mites on fowls, **53**.
parumpilosus, Trichodectes.
Parus ater, Phormia sordida in nests of, **138**.
parva, Theileria (*Piroplasma*).
Passer, Passeromyia heterochaeta in nests of, in the Congo, **138**.
Passer domesticus, Dermanyssus gallinae in nests of, in Britain, **142**.
Passer griseus, blood-sucking Muscids in nests of, **138**.
Passeromyia heterochaeta, attacking nestling birds in Africa, **16**, **138**.
pattoni, Herpetomonas.
pavonis, Goniodes.
Peafowl, lice infesting, **13**.
pecaudi, Trypanosoma.
pecorum, Trypanosoma.
pedalis, Haematopinus.
Pediculus, in Salonica, **179**.
Pediculus capitis, experimental transmission of flagellates of, **103**; experimentally carrying plague, **130**; measures against, **24**, **83**, **153**.
Pediculus corporis (see *P. humanus*).
Pediculus humanus, in Britain, **178**; in Serbia, **7**; anatomy of, **183**; a carrier of bubonic plague, **130**; conveying recurrent fever, **134**; measures against, **7**, **8**, **24**, **83**, **133**, **134**, **153**; effects of temperature on, **57**, **87**; (see also Lice).
Pediculus vestimenti (see *P. humanus*).
Pedioecetes phasianellus (Sharp-tailed Grouse), *Haemaphysalis cinnabarina* on, in Canada, **80**.
Pegomyia bicolor, in houses in Britain, **144**.
Pegomyia hyoscyami, introduced into U.S.A., **107**.
Pellagra, relation of *Simulium* to, **82**; probably not transmitted by *Simulium* in Jamaica, **90**.
penetrans, Dermatophilus.
Penguins, ticks on, in New Zealand, **55**.
Pennyroyal, Oil of, against fleas, **5**.
percavatus, Ixodes.
peregrinus, Ceratopogon; *Culicoides*.
perennis, Trupheoneura.
Periplaneta orientalis (see *Blatta*).
Pericoma townsvillensis, sp. n., attacking man in Queensland, **30**.
Peristera rufiaxilla, Pseudornithomyia ambigua, sp. n., on, in Brazil, **137**.
Perognathus californicus, Fahrenholzia tribulosa, sp. n., on, in North America, **177**.
Peromyscus, new fleas on, in British Columbia, **33**.
Peromyscus macrochirus, Catallagia charlottensis on, in British Columbia, **33**.
Persia, list of fleas from, **151**; dogs a possible reservoir of leishmaniasis in, **9**.
Persian Powder, against lice on fowls, **166**.
persicus, Argas.
pertinens, Haematopota.
perturbans, Taeniorhynchus (*Mansonia*).
Peru, *Pseudolfersia meleagridis*, sp. n., on *Meleagris gallopavo* in, **137**; ticks in, **55**; probable carriers of Uta in, **63**; *Phlebotomus verrucarum* carrying verruga in, **65**, **123**.
Petrol, against lice, **153**.
Petroleum, against fleas, **35**; against house-fly larvae, **93**; against lice, **104**; experiments with, on early stages of mosquitos, **164**; (see Kerosene and Paraffin).
phacochoeri, Haematopinus.
phaeostomum, Menopon.

Phalacrocorax graculus, Ixodes unicavatus on, in Britain, 142.
Phalacropsylla paradisea, sp. n., hosts of, in Arizona, 33.
Phalangomyia debilis, distribution of, in Peru, 65.
Phanurus emersoni, sp. n., parasite of Tabanid eggs in Texas, 122.
Phanurus floridanus, 122.
Phanurus opacus, 122.
Phanurus ovivorus, 122.
Phaonia erratica, bionomics of, in Britain, 143.
Phaonia signata, hibernation of, in houses, 121.
Phaonia variegata, in houses in Britain, 144.
pharaonis, Monomorium.
pharoensis, Anopheles.
Pharyngobolus, 122; probably identical with *Aulacephala*, 22.
Pharyngobolus africanus, parasite of the African elephant, 40.
Pharyngomyia, 22, 122.
Phascolomys, Ixodes victoriensis on, in Australia, 55.
Philaematomyia, in Nigeria, 113.
Philippines, relation between cholera and Phorid flies in, 52; mosquitos in, 120; freedom of, from plague due to rat-proof character of buildings in, 76.
Phlebotomus, 176; in Muscat, 172; in the Sahara, 157; and sand-fly fever in Sicily, 60; possible carriers of Biskra boil, 9; identification of, in the early stages, 32.
Phlebotomus argentipes, early stages of, 32.
Phlebotomus duboscqi, in Sierra Leone, 150.
Phlebotomus intermedius, in Brazil, 36.
Phlebotomus minutus, early stages of, 32; conveying leishmaniasis in Algeria, 103.
Phlebotomus papatasii, in France, 49; in Guatemala, 177; and sand-fly fever in the Mediterranean, 57; in Salonica, 179; early stages of, 32.
Phlebotomus verrucarum, probably the only carrier of verruga in Peru, 65, 123.
Phoniomyia, in Fiji, 41.
Phora, on battlefields, 18.
Phora aterrima, 51.
Phoridae, habits and relation of, to disease, 51.
Phormia azurea, distinct from *P. sordida*, 16; life-history and distribution of, 78.
Phormia groenlandica (see *Protocalliphora*).
Phormia regina, bionomics of, in U.S.A., 1, 5.
Phormia sordida, in nests of *Parus ater*, 138; distinct from *P. azurea*, 16.
Phosphorus, as a rat-poison to control plague, 155.
Phryxe vulgaris, in houses in Britain, 144.
Phthirius pubis, not common in the Russian army, 24, 25.
Phyllanthus emblica, a source of food for rats in Java, 129.
Phyllodromia (*Ectobia*) *germanica*, in Norway, 180; *Gongylonema scutatum* found in, 63.
Picric Acid, for protecting domestic animals from flies, 158.
pictipes, Simulium.
Pigeons, infected with *Haemoproteus columbae* by *Lynchia capensis*, 189; Hippoboscids on, in Brazil, 137; lice infesting, in U.S.A., 13, 166; distribution of *Lynchia maura* on, 107.
Pigs, trypanosomes in, in Tropical Africa, 18, 42, 66; killed by *Simulium* in Hungary, 158; relation of, to distribution of *Glossina palpalis* in Principe, 48; relation of *Simulium* to cholera in, 82; infested with *Echinorhynchus gigas*, 176; control of fleas on, 4, 35; lice on, destroyed by nitro-benzine, 79; *Wohlfartia magnifica* causing myiasis in, 88.
pilosus, Culex.
Piophila casei, experiments with baits for, 169.
Piophila vulgaris, bionomics of, in Britain, 143.
pipiens, Culex.
pirangae, Ornithomyia.
Pirates hybridus, in Algeria, 139.
Pirates strepitans, in Algeria, 139.
Piroplasma annulatum, causing Mediterranean Coast fever in Libya, 14.
Piroplasma bacilliforme (see *Theileria parva*).
Piroplasma bigeminum, in cattle, 68; carried by *Margaropus annulatus*, 64.
Piroplasma canis, in dogs, 59, 68.
Piroplasma divergens, conveyed by *Haemaphysalis cinnabarina* var. *punctata* in Britain, 34.
Piroplasma parvum (see *Theileria parva*).
Piroplasma quadrigeminum, probably carried by *Rhipicephalus sanguineus* in Tunis, 63.
Piroplasma tropica (see *P. annulatum*).

Piroplasmosis, in domestic animals in West Africa, **42, 67, 112**; and ticks in Brazil, **83**; in sheep in Egypt, **7, 192**; ticks conveying, in the Gold Coast, **42**; in cattle, carried by *Margaropus decoloratus*, **64**; in dogs, ticks conveying, **34, 64**; in horses, carried by *Rhipicephalus evertsi*, **64**; efficiency of trypanblue against, **69**.
Pistia, mosquito eggs attached to leaves of, **160**.
Pistia stratiotes, larvae of *Taeniorhynchus titillans* associated with, **177**.
placidum, *Simulium*.
Plague, quarantine measures against, in the Gambia, **159**; relation between fleas, rats and, in Java, **128**; New South Wales free from, **181**; causes of spread of, in the New World, **86**; and rats in Shanghai, **61**; and fleas, **4, 5**; experimentally carried by lice, **130**; loss of life due to, **34**; prevalence of, determined by rat-proof character of buildings, **76**; use of rat-poison to control, **154**; experiments with vaccine against, **75**.
Plasmodium falciparum, experiments with Anophelines and, **92, 136, 152**; not carried by *Anopheles punctipennis*, **136**.
Plasmodium malariae, among troops in France, **139**.
Plasmodium vivax, carried by *Anopheles maculipennis* in France, **139**; the commonest cause of malaria in Portugese East Africa, **130**; experiments with Anophelines and, **53, 92, 136, 152, 175**; (see Malaria).
Platystoma seminationis, in houses in Britain, **144**.
plebeia, *Thereva*.
plumbeus, *Anopheles* (*Coelodiazesis*).
plumosa, *Mimomyia*.
pluto, *Tabanus*.
pluvialis, *Anthomyia*.
Pneumotuber macaci, infesting the lungs of monkeys, **40**.
podopostyla, *Stilbometopa*.
Poecilochroa convictrix, living in nest of *Coenotele gregalis*, **9**.
poicilia, *Finlaya*.
Poland, measures against lice in, **35**.
Polecat, *Ixodes hexagonus* on, in England, **194**.
Polietes albolineata, bionomics of, in Britain, **145**.
Polietes lardaria, bionomics of, in Britain, **143, 145**.
Polistes hebraeus, predaceous on house-flies in Fiji, **41**.
polita, *Microchrysa*.
Pollenia rudis, bionomics of, in Britain, **87, 102, 121, 145**; in relation to disease, **46**; trapped with milk-baits in U.S.A., **5**.
Pollenia stygia, in Queensland, **183**; effect of eucalyptus oil on, **71**.
Polyplax jonesi, sp. n., on *Saccostomus campestris* in Zululand, **120**.
Polyplax otomydis, on *Otomys irroratus* in Zululand, **120**.
Polyplax spinulosus, on rats in Sierra Leone, **150**.
Polysulphide, in sheep dips, **188**.
polysticta, *Palpomyia*.
polytrapezius, *Lipeurus*.
poriceps, *Metathrombidium*.
potamida, *Stratiomyia*.
Potamochaerus choeropotamus, *Haematopinus phacochoeri* on, in South Africa, **120**.
Potassium Carbonate, in formula against mange on domestic animals, **178**.
Potassium Cyanide (see Hydrocyanic Acid).
Potassium Ferrocyanide, formula for making hydrocyanic acid with, **135**.
Potassium Polysulphide, in formula for dip against mange, **165**; in sheep dips, **188**.
praefectus, *Ceratophyllus*.
pratti, *Ixodes*.
priestleyi, *Calomyia*.
primaris, *Amphipsylla*.
Principe, history of extermination of *Glossina palpalis* in, **48**.
Probezzia infuscata, sp. n., in Illinois, **55**.
Probezzia pallida, in Illinois, **55**.
procus, *Megarthroglossus*.
Procyon lotor (Racoon), *Ixodes texanus* on, in Canada, **80**.
prolixus, *Rhodnius*.
Prometheomys schlaposchnikovi, *Ctenophthalmus inornatus*, sp. n., on, in Caucasia, **151**.
Promusca domestica (see *Musca*).
propria, *Uranotaenia*.
Protocalliphora azurea (see *Phormia*).
Protocalliphora (*Calliphora*) *groenlandica*, bionomics of, in Britain, **87, 102, 145, 169**.
protracta, *Triatoma*.
pruina, *Culex*.
pruinosum, *Simulium*.
pseudoardens, *Tabanus*.
Pseudoculicoides griseus, attacking man in Illinois, **55**.
Pseudoculicoides major, possibly a synonym of *P. griseus*, **55**.

Pseudohowardina linealis, in Queensland, **60**.
Pseudolfersia meleagridis, sp. n., on birds in Brazil, **137**.
Pseudolfersia spinifera, on *Fregata aquila* in Brazil, **137**.
Pseudolfersia vulturis, on vultures in Mexico, **138**.
pseudolucilia, *Paratricyclea*.
pseudopunctipennis, *Anopheles*.
Pseudopyrellia cornicina, bionomics of, in Britain, **145**.
Pseudornithomyia ambigua, gen. et sp. n., on birds in Brazil, **137**, **138**.
Pseudorthellia, generic name proposed for *Lucilia viridiceps*, **159**.
pseudoscutellaris, *Stegomyia*.
Pseudoskusea basalis, in Australia, **11**, **182**.
pseudotaeniatus, *Ochlerotatus*.
Pseudotyphoid Fever, and its carriers in Sumatra, **52**.
Psorophora ciliata, larvae of, predaceous on those of other mosquitos, **170**.
Psorophora columbiae, breeding-places of, in North Carolina, **61**, **136**.
Psorophora discolor, breeding-places of, in North Carolina, **136**.
Psorophora sayi, breeding-places of, in North Carolina, **136**.
Psoroptes communis var. *bovis*, in South Africa, **187**.
Psoroptes communis var. *caprae*, on goats in South Africa, **186**.
Psoroptes communis var. *cuniculi*, on rabbits in South Africa and U.S.A., **95**, **187**.
Psoroptes communis var. *equi*, causing mange on horses, **178**.
Psoroptes communis var. *ovis*, bionomics and control of, in South Africa, **184–187**.
Ptarmigan, *Ornithomyia avicularia* on, in Norway, **180**.
Pteromalus, parasite of Lepidoptera, **121**.
Ptilonyssus nudus, on sparrows in Britain, **142**.
pubescens, *Erephopsis*.
pubis, *Phthirius*.
Puffin, *Ixodes percavatus* var. *rothschildi* on, in Britain, **142**.
pulchellus, *Rhipicephalus*.
pulcherrima, *Uranotaenia*.
Pulex irritans (Human Flea), in Britain, **166**; in Salonica, **179**; control of, in U.S.A., **34**; on dogs, **58**; probably not a carrier of kala-azar, **49**; failure to infect, with leishmaniasis, **103**; and plague, **4**; (see also Fleas).
pulicaris, *Nitzschia*.
pulicis, *Nosema*.
punctata, *Haemaphysalis cinnabarina*.
punctigera, *Lyperosia*.
punctimacula, *Anopheles*.
punctipennis, *Anopheles*.
punctocostalis, *Banksinella*.
punctolateralis, *Stegomyia* (see *Mimetcomyia atripes*).
punctothoracis, *Ochlerotatus*.
punctulatus, *Anopheles*.
puniens, *Haematopota*.
pusilla, *Microlynchia*.
pusillus, *Cotocripus*.
Putorius longicaudatus, *Neopsylla inopina* on, in Canada, **33**.
Putorius putorius, *Neopsylla spinea* on, in Rumania, **33**.
Putorius xanthogenys, *Ceratophyllus ignotus fransciscanus* on, in U.S.A., **33**.
putus, *Ixodes*.
Pycnosoma bezzianum, causing myiasis in French Guinea, **21**.
Pycnosoma megacephalum (see *P. bezzianum*).
Pycnosoma (*Calliphora*) *rufifacies*, in Queensland, **183**; effect of eucalyptus oil on, **71**.
Pycnosoma varipes, effect of eucalyptus oil on, **71**.
Pygiopsylla ahalae, and plague, **4**; distribution of, on rats in Java, **128**.
pygmaea, *Erephopsis*.
Pyrellia ano-rufa, sp. n., from Cape Colony, **125**.
Pyrellia bequaerti, sp. n., from Ruwenzori, **125**.
Pyrellia cadaverina, from the Belgian Congo, **125**.
Pyrellia distincta, sp. n., from the Belgian Congo, **125**.
Pyrellia ditissima, sp. n., distribution of, in Africa, **125**.
Pyrellia eriophthalma, bionomics of, in Britain, **87**, **102**, **121**, **145**.
Pyrellia laxifrons, sp. n., from the Belgian Congo, **125**.
Pyrellia maculisquama, sp. n., from East Africa, **125**.
Pyrellia versatilis, sp. n., from Ruwenzori, **125**.
Pyrethrum, against lice on fowls, **166**; effect of, on mosquitos, **61**; in dips for protecting sheep from blow-flies, **71**.
Pyrethrum roseum, tincture of, ineffective against *Stegomyia fasciata*, **61**.
Pyretophorus (see *Anopheles*).
Pyretophorus myzomyifacies (see *Anopheles turkhudi*).

Q.

quadrigeminum, Piroplasma.
quadrimaculatus, Anopheles.
quasigelidus, Culex.
quasiornata, Mimeteomyia (Stegomyia).
quasiunivittatus, Ochlerotatus.
Queensland, experiments with dengue and mosquitos in, **196**; distribution of mosquitos in, **60**; mosquitos and Tabanids from, **183**; list of mosquitos and ticks from, **10**; *Pericoma townsvillensis*, sp. n., attacking man in, **30**; *Silvius fulvohirtus*, sp. n., in, **91**.
Quinine, use of, against malaria, **19**, **173**; against tick-borne diseases in dogs, **59**.
quinquefasciatus, Culex (see *C. fatigans*).
quinquevittatus, Eretmopodites.

R.

Rabbits, experiments with *Leishmania donovani* and, **125**; mites on, in U.S.A., **96**; effect of bite of *Ornithodorus coriaceus* on, **119**; *Psoroptes communis* var. *cuniculi* on, in South Africa, **187**; *Psoroptes communis* var. *ovis* unable to live on, **185**; ticks on, in Canada, **80**; negative result of inoculating *Trypanosoma vivax* into, **42**.
Rachionotomyia caeruleocephala, in Sumatra, **23**.
radicum, Anthomyia.
Rangelia vitalii, sp. n., disease in dogs in Brazil due to, **59**.
raptatorum, Olfersia.
Rats, experimentally infected with flagellates, **103**; fleas on, **4**, **66**, **75**, **127**, **150**, **181**; *Haemogamasus oudemansi* on, in Britain, **142**; experiments with leprosy and, **85**; *Nuttallia decumani* in, in the Gold Coast, **42**; and plague, **61**, **76**, **128**, **155**; buildings protected from, influencing prevalence of plague, **76**; susceptible to Rocky Mountain spotted fever, **77**; negative result of inoculating *Trypanosoma vivax* into, **42**; trypanosomes in, **181**; distribution of, in Java, **128**; legislation against, in Louisiana, **137**; hydrocyanic acid against, **94**, **155**; effect of nitrobenzine on, **79**; poisons for, **155**; (see *Epimys* and *Mus*).
Ravinia communis, trapped with milk-baits in U.S.A., **5**.
Ravinia latisetosa, trapped with milk-baits in U.S.A., **5**.
recula, Ceratophyllus ignotus.
Recurrent Fever, conveyed by lice, **17**, **134**.
Reduvius mayeti, probably not a carrier of goitre in Algeria, **139**.
Redwater, conveyed by *Haemaphysalis cinnabarina* var. *punctata* in Britain, **34**; (see Piroplasmosis).
Reedomyia pampangensis (see *Ochlerotatus*).
regina, Phormia.
regisgeorgii, Tabanus.
Relapsing Fever, transmitted by *Ornithodorus moubata* in Africa, **63**, **119**, **131**.
reptans, Simulium.
Reptiles, probably not providing food for *Glossina morsitans*, **114**; Haemogregarines in, in the Gold Coast, **81**.
Resin, and castor oil as an adhesive, **20**; in adhesives for trapping flies, **53**; for making fly-papers, **181**; ingredient of mosquito larvicide, **98**.
restuans, Culex.
reticulatus, Dermacentor; *Ornithodorus* (see *O. talaje*).
Réunion, fish imported from, into Madagascar against mosquito larvae, **195**.
Reviews, Ealand, Insect Enemies, **183**; Herms, Medical and Veterinary Entomology, **176**; Le Prince and Orenstein, Mosquito Control in Panama, **97**.
Rhinoceros simus, *Lyperosia* spp. feeding on, **68**.
Rhinolophus ferrumequinum, *Ixodes vespertilionis* on, in Britain, **142**.
rhipicephali, Cryptoplasma.
Rhipicephalus appendiculatus, carrying African coast fever, **64**; in Italian Somaliland, **70**; formula for dipping fluid against, **46**.
Rhipicephalus capensis, carrying African coast fever, **64**.
Rhipicephalus ecinctus, in Italian Somaliland, **70**.
Rhipicephalus evertsi, on domestic animals in Egypt, **192**; carrying piroplasmosis in horses, **64**.
Rhipicephalus falcatus, in Sierra Leone, **45**.
Rhipicephalus lunulatus, in Sierra Leone, **45**.
Rhipicephalus oculatus, on camels in Egypt, **192**.
Rhipicephalus pulchellus, in Italian Somaliland, **70**.

Rhipicephalus sanguineus, parasitised by *Hunterellus hookeri* in Brazil, **39**; on dogs in Egypt, **192**; on dogs, etc., in Sierra Leone, **45**, **150**; *Cryptoplasma rhipicephali* recorded in error as a parasite of, in Tunis, **63**, **121**; carrying piroplasmosis in dogs, **64**.

Rhipicephalus simus, on dogs in Sierra Leone, **150**; in Italian Somaliland, **70**; carrying Rhodesian fever in cattle, **64**.

Rhodesia, compulsory dipping of cattle in, **171**; bionomics of *Glossina morsitans* in. **77**, **117**, **122**; mosquitos in, **120**; *Ornithodorus moubata* associated with wart-hogs in, **44**, **102**; *Passeromyia heterochaeta* in, **138**; sleeping-sickness and other insect-borne diseases in, **107**, **108**, **151**; tick-borne diseases and their control in, **46**, **73**, **171**, **172**; relations of tsetse-fly and big game in, **77**.

Rhodesian Fever, in cattle, carried by *Rhipicephalus simus*, **64**.

rhodesiense, *Trypanosoma*.

rhodesiensis, *Anopheles*.

Rhodnius prolixus, coprophagism in, **38**.

Rhombomys opimus, new fleas on, in Turkestan, **32**.

richardii, *Taeniorhynchus* (*Mansonia*).

ricinus, *Ixodes*.

rima, *Culex*.

Rocky Mountain Spotted Fever, conveyed by *Dermacentor* in U.S.A., **76**, **77**, **154**.

rodhaini, *Cordylobia* (*Stasisia*).

Roe-deer, *Ixodes ricinus* on, in Britain, **142**.

Rosemary, Oil of, against cockroaches, **140**.

rossi, *Anopheles*.

rothschildi, *Ixodes percavatus*.

rotundatus, *Cimex* (see *C. hemiptera*).

rubidus, *Tabanus*.

rubiginosus, *Alcimus*.

rubrithorax, *Ochlerotatus*; *Simulium*.

rubrofasciata, *Triatoma* (*Conorhinus*).

rudis, *Pollenia*.

ruficrus, *Tabanus*.

rufifacies, *Pycnosoma* (*Calliphora*).

rufinotatus, *Tabanus*.

rufipes, *Aphiochaeta*.

rufiventris, *Hyalomyia*.

Rumania, a new *Neopsylla* from, **33**.

ruralis, *Voria*.

Russia, control of lice in, **13**; bionomics of *Wohlfartia magnifica* in, **88**.

S.

Sabethes, in Guatemala, **177**.

Sabethoides nitidus, breeding-places of, in Trinidad, **69**.

saccharina, *Lepisma*.

Saccharum spontaneum, a source of food for rats in Java, **129**.

Saccostomus campestris, *Polyplax jonesi* on, in Zululand, **120**.

sagax, *Ochlerotatus* (*Culex*).

saginata, *Taenia*.

Sahara, biting-flies and disease in, **156**.

Salicylic Aldehyde, effect of, on animal parasites, **79**.

salinarius, *Culex*.

salisburiensis, *Culex*.

Salonica, medical entomology of, **179**.

Sand-fly Fever, not recorded in Guatemala, **177**; and *Phlebotomus papatasii* in the Mediterranean, **57**; and *Phlebotomus* in Sicily, **60**.

sanguinarius, *Tabanus*.

sanguineum, *Simulium*.

sanguineus, *Rhipicephalus*; *Tabanus*.

sanguinolentus, *Bdellolarynx*.

sanguisugens, *Haematobia*.

sanguisugus, *Culicoides*.

Sanitas-okol, effective against mosquito larvae, **131**.

Saponin, for protecting domestic animals against house-flies, **158**.

Sarcophaga, traps for, in Egypt, **142**; in Salonica, **179**.

Sarcophaga aurifrons, in Queensland, **183**.

Sarcophaga bullata, trapped with milk-baits in U.S.A., **5**.

Sarcophaga carnaria, **88**; bionomics of, in Britain, **143**, **169**; in Gallipoli, **92**; on battlefields, **18**.

Sarcophaga haemorrhoidalis, trapped with milk-baits in U.S.A., **5**.

Sarcophaga helicis, trapped with milk-baits in U.S.A., **5**.

Sarcophaga latifrons, not causing myiasis, **88**.

Sarcophaga magnifica (see *Wohlfartia*).

Sarcophaga melanura, bionomics of, in Britain, **143**.

Sarcophaga nurus, in French Guinea, **21**.

Sarcoptes scabiei, in Salonica, **179**.

Sarcoptes scabiei var. *bovis*, in South Africa, **187**.

Sarcoptes scabiei var. *canis*, causing mange in dogs, **58**.

Sarcoptes scabiei var. *equi*, causing mange in horses, **178**.

Sarcoptes scabiei var. *ovis*, carried by dogs, **58**.

Sardinia, cattle from, nearly immune to Mediterranean coast fever, **15**.

Sargus cuprarius, bionomics of, in Britain, **108**, **144**.

Sargus iridatus, in houses in Britain, **144**.

satunini, Hystrichopsylla.

savignyi, Ornithodorus.

sayi, Psorophora.

scabiei, Sarcoptes.

Scabies, in sheep and its control, **58**, **148**, **184–187**.

scalaris, Fannia.

Scandinavia, absence of *Wohlfartia magnifica* from, **88**.

Scatophaga stercoraria, bionomics of, in Britain, **108**, **143**; trapped with milk-baits in U.S.A., **5**; in relation to disease, **46**.

schelkovnikovi, Amphipsylla.

Schistosomum mansoni, and house-flies in British East Africa, **54**.

schlaposchnikovi, Prometheomys.

schüffneri, Anopheles.

Scipio aulacodi, on *Thryonomys* in South Africa, **120**.

Scipio breviceps, sp. n., on *Thryonomys* in South Africa, **120**.

Sciurus, *Ixodes granulatus* on, in India, **55**.

Sciurus douglasi, *Ixodes texanus* on, in Canada, **80**.

Sciurus douglasi albolimbatus, *Neohaematopinus antennatus* var. *semifasciatus* on, in North America, **177**.

Sciurus griseus nigripes, *Enderleinellus kelloggi* on, in North America, **177**.

Sciurus hudsonicus, *Ixodes dentatus* var. *spinipalpis* on, in Canada, **55**; *Neopsylla faceta* on, in U.S.A., **33**.

Sciurus richardsoni baileyi, *Megarthroglossus longispinus* on, in Canada, **33**.

scorpioides, Chelifer.

Scorpions, destroying mosquitos in Sierra Leone, **163**.

Screw-worm Fly (see *Chrysomyia macellaria*).

scutatum, Gongylonema.

scutellaris, Olfersia; *Stegomyia*.

Scutomyia notoscriptus (see *Ochlerotatus*).

scythicus, Arvicola terrestris.

Sea Lions, Anoplura infesting, in the Pacific, **196**.

Sea Water, experiments with, on early stages of mosquitos, **164**.

secedens, Tabanus.

secura, Neopsylla.

Selasoma tibiale in Brazil, **36**.

semiargentata, Limnophora.

semifasciatus, Neohaematopinus antennatus.

seminationis, Platystoma.

Senegal, an early record of mosquitos as disease-carriers in, **16**; *Cantharis* causing dermatitis in, **15**; danger of introduction of yellow fever from, into Morocco, **40**; verminous enteritis among sheep in, **14**.

separatus, Anopheles.

septemnotata, Limnophora.

septentrionalis, Megarhinus.

Serbia, experiments in the control of lice in, **7**; cattle from, very susceptible to Mediterranean coast fever, **15**.

sericata, Lucilia.

serrata, Blepharoptera; *Leria*.

serraticeps, Ctenocephalus (see *C. canis*).

setigena, Fannia.

Shanghai, measures against plague in, **61**.

Sheep, bionomics and control of *Psoroptes communis* var. *ovis* on, in South Africa, **184–187**; bionomics of lice infesting, in Australasia, **111**; value of birds destroying parasites of, in Australia, **110**; dips for protecting, from blow-flies in Australia, **70–72**; *Ixodes ricinus* on, in Britain, **142**; *Dermacentor variabilis* on, in Canada, **80**; insect-borne disease of, in the Belgian Congo, **67**, **68**; piroplasmosis in, in Egypt, **7**, **192**; causes of staggers in, in Germany, **10**; trypanosomiasis and other diseases of, in the Gold Coast, **42**; *Hippobosca maculata* on, in French Guinea, **21**; killed by *Simulium* in Hungary, **158**; piroplasmosis in, in Nigeria, **112**; wool-maggots of, in U.S.A., **1**; heartwater in, carried by *Amblyomma hebraeum*, **64**; infested with *Gongylonema scutatum*, **63**; serum of, fatal to *Leishmania donovani*, **174**; control of lice on, **91**; *Melophagus ovinus* on, destroyed by nitrobenzine, **79**; flies causing myiasis in, **2**, **88**; not attacked by *Psoroptes communis* var. *cuniculi*, **187**; control of scabies on, **148**; intestinal worms conveyed to, by house-flies, **12**; dips for, **179**.

Sheep-maggot Flies, in Australia, **70**, **122**, **179**, **183**; in U.S.A., **1**; parasitised by *Chalcis calliphorae*, sp. n., **179**.

Sheep-scab, bionomics and control of, in South Africa, 184–187.
Ships, measures against mosquitos on, 59; fumigation of, 94.
Siberia, measures against bed-bugs in, 190.
sicamus, Megarthroglossus.
Sicily, sand-fly fever and *Phlebotomus* in, 60.
Sierra Leone, blood-sucking insects of, 44, 149; mosquitos and malaria in, 44; bionomics and control of *Stegomyia fasciata* and other mosquitos in, 120, 161–164; yellow fever in, 150.
Sigmodon hispidus, *Hoplopleura hirsuta* on, in North America, 177.
signata, Monedula; *Phaonia.*
signifer, Orthopodomyia (Bancroftia).
silacea, Chrysops.
Silvius alcocki, in N. Australia, 91.
Silvius australis, in New South Wales, 182.
Silvius borealis, sp. n., in Australia, 91.
Silvius elongatus, sp. n., in Australia, 91.
Silvius frontalis, in Queensland, 183.
Silvius fuliginosus, sp. n., in Australia, 91.
Silvius fulvohirtus, sp. n., in Queensland, 91.
Silvius hilli, sp. n., in Australia, 91, 183.
Silvius sordidus, sp. n., in Australia, 8, 91.
Silvius tabaniformis, sp. n., in Australia, 91.
Silvius trypherus, sp. n., in Australia, 91.
simiae, Trypanosoma.
similis, Haematopota.
simplex, Culex.
simpsoni, Culex; *Stegomyia.*
simulans, Ochlerotatus.
simuliae, Crithidia.
Simuliidae, in Nyasaland, 171.
Simulium, hibernation of, in houses, 121; attacking domestic animals in Hungary, 158; probably not transmitting pellagra in Jamaica, 90; in Salonica, 179.
Similium amazonicum, in Brazil, 36.
Simulium bracteum, bionomics of, in U.S.A., 82.
Simulium brevibranchium, in Brazil, 36.
Simulium dentulosum, sp. n., in British East Africa, 39.
Simulium diversifurcatum, in Brazil, 36.
Simulium incrustatum, in Brazil, 36.
Simulium johannseni, bionomics of, in U.S.A., 82.
Simulium limbatum, sp. n., in British Guiana, 30.
Simulium neavei, sp. n., in Uganda, 39.
Simulium orbitale, in Brazil, 36.
Simulium paraguayense, in Brazil, 36.
Simulium pictipes, bionomics of, in U.S.A., 81.
Simulium placidum, sp. n., on equines in Trinidad, 30.
Simulium pruinosum, in Brazil, 36.
Simulium reptans, causing death of cattle in Germany, 126.
Simulium rubrithorax, in Brazil, 36.
Simulium sanguineum, sp. n., attacking man in Colombia, 30.
Simulium spinibranchium, in Brazil, 36.
Simulium subviride, in Brazil, 36.
Simulium venustum, bionomics of, in U.S.A., 81, 82.
Simulium vittatum, bionomics of, in U.S.A., 81.
simus, Rhipicephalus.
singalensis, Haematopota.
sinensis, Anopheles.
siro, Tyroglyphus.
sitiens, Culex.
Skunk, *Pulex irritans* on, 4.
Skusea funerea (see *Aëdes*).
Sleeping Sickness, distribution of, in French Equatorial Africa, 83; and *Glossina* in the Belgian Congo, 56; distribution of, in the Lower Ivory Coast, 84; measures against, in Kamerun, 110; in Nigeria, 66; and *Glossina morsitans* in Nyasaland and Northern Rhodesia, 18, 118; distribution of, in Southern Rhodesia, 107.
Snakes, experimentally infected with insect flagellates, 103.
Soap, experiments with, on early stages of mosquitos, 164.
socialis, Tabanus.
socius, Tabanus.
Soda, in formula for treating mange in horses, 70; ingredient of mosquito larvicide, 98.
Soda and Sulphur Dip, chemistry of, 187.
Sodium Arsenite, in poisoned bait for biting flies, 27; in baits and sprays for house-flies, 80, 92, 191; in dips against ticks, 46, 160.
Sodium Carbonate, in formulae against lice on horses, 178; in formula for dip against mange, 165.
Sodium Fluoride, against cockroaches, 140.

Sodium Pentasulphide, in sheep dips, **187**.

Sodium Thiosulphate, in sheep dips, **187**.

Solenopsis geminata, destroying mosquitos in Sierra Leone, **163**.

sollicitans, Ochlerotatus (*Aëdes*).

Somaliland, Italian, list of ticks from, **70**.

sordida, Phormia; *Triatoma*.

sordidus, Silvius.

Spain, *Culex univittatus* in, **120**; *Stegomyia fasciata* in, **40**.

spalacis, Ctenophthalmus.

Spalangia, parasite of *Musca*, **121**.

Spalax microphthalmus, *Ctenophthalmus spalacis* on, in Caucasia, **151**.

Spaniopsis clelandi, sp. n., bionomics of, in New South Wales, **41**.

Spaniopsis longicornis, sp. n., in New South Wales, **42**.

Spaniopsis marginipennis, sp. n., in New South Wales, **42**.

Spaniopsis vexans, sp. n., in New South Wales, **42**.

Sparrow, a harmful bird in Australia, **110**; *Ptilonyssus nudus* on, in Britain, **142**; probably distributing *Liponyssus bursa*, **159**.

Sparrow-hawk, *Olfersia raptatorum* on, in Brazil, **138**.

spathipalpis, Theobaldia.

Spermestes cucullata, blood-sucking Muscids in nest of, **138**.

Spermophilus citellus, *Neopsylla spinea* on, in Rumania, **33**.

Spermophilus richardsoni, *Neopsylla inopina* on, in Canada, **33**.

sphaerocephalus, Trichodectes.

Sphyracephala hearseyana, life-history of, in India, **91**.

Spiders, destroying mosquitos in Sierra Leone, **163**.

Spilogale, *Megarthroglossus procus* on, in British Columbia, **33**.

Spilopsyllus cuniculi, in Britain, **166**.

spinibranchium, Simulium.

spinea, Neopsylla.

spinifera, Pseudolfersia.

spinipalpis, Ixodes dentatus.

spinipennis, Digonochaeta.

spinulosus, Polyplax.

Spirochaetosis, in fowls in the Gold Coast, **81**; transmitted to fowls by *Argas persicus*, **101**, **192**.

Spirogyra, *Simulium* larvae feeding on, **82**.

Spiroptera macrostoma, conveyed to sheep by house-flies, **12**.

splendidum, Amblyomma.

squalidus, Lipeurus.

squamiger, Aëdes.

squamipennis, Aëdomyia.

squamosa, Neocuterebra.

squamosus, Culex.

Squirrels, ticks on, in Canada, **80**; new fleas on, **33**; (see *Citellus* and *Sciurus*).

stabulans, Muscina.

stantoni, Haematopota.

Starling, an injurious bird in Australia, **110**.

Stasisia rodhaini (see *Cordylobia*).

Stegomyia, and yellow fever in Australia, **135**; in Guatemala, **177**; on ships in Mexico, **59**.

Stegomyia africana, in Nigeria, **66**, **112**; in Sierra Leone, **45**.

Stegomyia apicoargentea, in Sierra Leone, **45**.

Stegomyia atripes, in New South Wales, **182**.

Stegomyia calopus (see *S. fasciata*).

Stegomyia fasciata, distribution and breeding-places of, in West Africa, **21**, **44**, **45**, **66**, **81**, **112**, **148**, **150**, **161–164**, **165**; distribution of, in Australia, **10**, **11**, **60**; relation of, to dengue in Australia, **73**, **148**, **149**, **196**; breeding in ships in Brazil, **37**; absent from Diego, California, **159**; breeding-places of, in North Carolina, **61**, **136**; in Ecuador, **149**; distribution of, in South-west Europe, **40**; in Fiji, **41**; quarantine measures against, in the Gambia, **159**; distribution of, in Hong Kong, **39**; in Morocco, **85**; in Natal, **120**; control of, in Panama, **97**, **99**; in Principe, **49**; in Salonica, **179**; in Sumatra, **23**; breeding-places of, in Trinidad, **69**; and yellow fever, **12**, **59**, **66**, **99**, **110**, **135**, **148**, **149**, **150**, **159**, **165**; bionomics of, in captivity, **27**; experiments with eggs of, **116**; *Pyrethrum roseum* ineffective against, **61**.

Stegomyia hilli (see *Mimeteomyia*).

Stegomyia luteocephala, bionomics of, in West Africa, **66**, **112**, **163**.

Stegomyia metallica, breeding-places of, in West Africa, **112**.

Stegomyia pseudoscutellaris, distribution of, in Australia, **60**; in Fiji, **41**.

Stegomyia punctolateralis (see *Mimeteomyia atripes*).

Stegomyia quasiornata (see *Mimeteomyia*).

Stegomyia scutellaris, anatomy of, **74**; distribution of, in Australia, **2**, **60**; distribution of, in Hong Kong, **39**; in Sumatra, **23**.

Stegomyia simpsoni, bionomics of, in West Africa, 45, 66, 112, 161, 163.

Stegomyia sugens, bionomics of, in West Africa, 44, 45, 66, 112, 163, 165; failure to infect with leishmaniasis, 103.

Stegomyia tasmaniensis, in Tasmania, 183.

stellifer, *Culicoides*.

Stenomalus muscarum, associated with hibernating flies in Britain, 121.

Stenopteryx hirundinis, in Norway, 180.

stephensi, *Anopheles* (*Neocellia*); *Culicoides*.

stercoralis, *Strongyloides*.

stercoraria, *Scatophaga*.

stevensi, *Neopsylla*.

Stibasoma, in Brazil, 37.

sticticollis, *Tabanus*.

stigmatosoma, *Culex*.

Stilbometopa podopostyla, on pigeons in Brazil, 137.

Stomatoceras exaratum, sp. n., parasite of *Glossina morsitans* in Nyasaland, 65.

Stomatoceras micans, sp. n., parasite of *Glossina morsitans* in Nyasaland and Northern Rhodesia, 29, 65, 117.

Stomoxys, and disease, 58; in the Gold Coast, 151; transmitting *Trypanosoma cazalboui*, 67; possibly conveying trypanosomiasis in Accra, 42; effect of dipping on, 170; larvae of, controlled by lime in Fiji, 41.

Stomoxys calcitrans, 51; in Northern Australia, 8; bionomics of, in Britain, 108, 143; in the Belgian Congo, 67; in Gallipoli, 92; in Muscat, 172; in Nigeria, 112, 113; in Salonica, 179; in Sierra Leone, 45; probable carrier of swamp-fever in U.S.A.. 14; transmitting anthrax, 58; in relation to disease, 46; dispersal of, by man, 96; poisoned bait for, 27.

Stomoxys nigra, in Nigeria, 113; in Principe, 49; in Sierra Leone, 45; a potential carrier of *Trypanosoma nigeriense*, 112.

Stomoxys omega, in Nigeria, 113.

straminea, *Cynonycteris*.

Stratiomyia chameleon, experimental transmission of flagellates of, 103.

Stratiomyia potamida, experimental transmission of flagellates of, 103.

strepitans, *Pirates*.

striaticeps, *Trombidium*.

striatum, *Amblyomma*.

Strongyloides stercoralis, infesting man in British East Africa, 54.

Stygeromyia maculosa, breeding-places of, in India, 24.

stygia, *Pollenia*.

stylifer, *Cotocripus*; *Goniodes*.

subangustus, *Tabanus*.

subcantans, *Ochlerotatus* (*Aëdes*).

subnitidus, *Culicoides*.

subspinosus, *Macrodactylus*.

subviride, *Simulium*.

sudanensis, *Ochlerotatus*.

sugens, *Stegomyia*.

sulcipes, *Acanthaspis*.

Sulphur, fumigation with, against fleas and mites, 35, 167; in preparations against mange on domestic animals, 123, 126, 178; chemistry of, in dips for sheep, 187–189; in dips for sheep scab, 148, 184, 187–189; effect of, on sheep flies, 71; ineffective against lice, 8, 25, 133, 193; ineffective against mites on fowls, 53.

Sulphur Dioxide, against cockroaches, 140.

Sulphuric Ether, effect of, on larvae of *Wohlfartia magnifica*, 89.

Sulphurous Anhydride, destroying lice, 82.

Sumatra, malaria and mosquitos in, 23, 130; parasitic worms in cattle in, 70; pseudo-typhoid fever and its carriers in, 52.

superpictus, *Anopheles* (*Pyretophorus*).

surcoufi, *Kirkioestrus*.

Swallows, blood-sucking Muscids in nests of, 81, 138; Hippoboscids on, in Brazil, 138; *Dermanyssus*, in Britain and French Guinea, 21, 142.

Swamp-fever, distribution and probable carriage of, by *Stomoxys calcitrans*, 14.

sylvatica, *Leptocera*.

sylvaticus, *Apodemus*.

sylvestris, *Ochlerotatus* (*Aëdes*).

Symbiotes equi (see *Chorioptes*).

Syntomosphyrum glossinae, hyperparasite of *Glossina morsitans* in Nyasaland, 65, 113, 118.

T.

Tabanidae, in North America, 176; new, from Australia, 91, 182, 183; in the Belgian Congo, 68; in Brazil, 36, 37; conveying anthrax in China, 101; in the Gold Coast, 12, 81; from Hong Kong, 65; life-history of, in

India, **91**; in Nigeria, **66**, **112**; probable carriers of Apaicha in Peru, **63**; believed to carry trypanosomiasis in the Sahara, **157**; in Sierra Leone, **45**, **150**; natural enemies of, **122**, **171**; new, from Malay States, **65**.

tabaniformis, Silvius.

Tabanus albimedius, in Hong Kong, **65**.

Tabanus albipalpus, in Nigeria, **66**, **113**.

Tabanus besti, in Nigeria, **66**; in Sierra Leone, **45**.

Tabanus biguttatus, in the Belgian Congo, **68**; in the Gold Coast, **12**.

Tabanus biguttatus croccus, in the Gold Coast, **81**.

Tabanus billingtoni, in Nigeria, **66**, **113**.

Tabanus brevivitta, in Northern Australia, **8**.

Tabanus cincrescens, in Australia, **8**, **182**, **183**.

Tabanus circumdatus, in New South Wales, **182**.

Tabanus congoiensis, in Principe, **48**, **49**; in Sierra Leone, **45**, **150**.

Tabanus crassus in Hong Kong, **65**.

Tabanus denshami, Bembex predaceous on, in Nyasaland, **171**.

Tabanus ditaeniatus, in the Gold Coast, **81**; in Hong Kong, **65**.

Tabanus fasciatus, in Nigeria, **66**, **113**; in Sierra Leone, **45**, **150**.

Tabanus flavothorax, in Hong Kong, **65**.

Tabanus fuscipes, natural enemies of, in Nyasaland, **171**.

Tabanus gregarius, in Northern Australia, **8**.

Tabanus hilaris, in Hong Kong, **65**.

Tabanus hongkongiensis, sp. n., in Hong Kong, **65**.

Tabanus hybridus, in Hong Kong, **65**.

Tabanus indianus, in Hong Kong, **65**.

Tabanus jucundus, in Hong Kong, **65**.

Tabanus kingsleyi, in Sierra Leone, **45**.

Tabanus laverani, in Sierra Leone, **45**.

Tabanus lineatus, in Northern Australia, **8**.

Tabanus macfarlanei, sp. n., in Hong Kong, **65**.

Tabanus mandarinus, in Hong Kong, **66**.

Tabanus marmorosus, in Sierra Leone, **45**.

Tabanus mastersi, in Queensland, **183**.

Tabanus miles, in Brazil, **36**.

Tabanus nigritarsis, in Australia, **8**, **182**, **183**.

Tabanus obscurehirtus, in Nigeria, **66**.

Tabanus obscurissimus, in Sierra Leone, **150**.

Tabanus oculatus, in New South Wales, **182**.

Tabanus par, in Sierra Leone, **45**.

Tabanus pluto, in Sierra Leone, **45**.

Tabanus pseudoardens, in New South Wales, **182**.

Tabanus regisgeorgii, in New South Wales, **182**.

Tabanus rubidus, in Hong Kong, **65**.

Tabanus ruficrus, in the Belgian Congo, **68**; in Sierra Leone, **45**.

Tabanus rufinotatus, in Queensland, **183**.

Tabanus sanguinarius, in New South Wales, **182**.

Tabanus sanguineus, in Hong Kong, **65**.

Tabanus secedens, in the Belgian Congo, **68**; in Nigeria, **66**, **113**.

Tabanus socialis, in Nigeria, **66**, **113**; in Sierra Leone, **45**.

Tabanus socius, in the Belgian Congo, **68**.

Tabanus sticticollis, in Sierra Leone, **45**.

Tabanus subangustus, in Sierra Leone, **45**.

Tabanus taeniola, in the Gold Coast, **12**; in Nigeria, **113**; *Bembex* predaceous on, in Nyasaland, **171**; in Principe, **49**; in Sierra Leone, **45**.

Tabanus taeniola var. *variatus*, *Bembex* predaceous on, in Nyasaland, **171**.

Tabanus taylori, in New South Wales, **182**.

Tabanus vetustus, in New South Wales, **182**.

tachinoides, Glossina.

Taenia saginata, and house-flies in British East Africa, **54**.

Taeniorhynchus, attacking cattle in India, **91**.

Taeniorhynchus acer, in Australia, **8**, **60**.

Taeniorhynchus annetti, in Nigeria, **66**; in Sierra Leone, **150**.

Taeniorhynchus arribalzagae, egg-masses of, **160**.

Taeniorhynchus aureus, in Natal, **120**.

Taeniorhynchus aurites, in Northern Australia, **11**; in Nigeria, **66**.

Taeniorhynchus brevicellulus, in Northern Australia, **11**; in Fiji, **41**; in Sumatra, **23**.

Taeniorhynchus chubbi, in Natal, **120**.

Taeniorhynchus conopas, in Sumatra, **23**.
Taeniorhynchus fasciolatus, egg-masses of, **160**.
Taeniorhynchus fuscopennatus, distribution of, in Africa, **120**.
Taeniorhynchus humeralis, eggs of, attached to leaves of *Pistia*, **160**.
Taeniorhynchus metallicus, in Natal, **120**; in Nigeria, **66**.
Taeniorhynchus perturbans, egg-masses of, **160**; larvae of, associated with water-plants, **170**.
Taeniorhynchus richardii, in Germany, **16**.
Taeniorhynchus titillans, uncommon in Brazil, **37**; eggs of, attached to leaves of *Pistia*, **160**; larvae of, deriving air from water-plants, **177**.
Taeniorhynchus uniformis (see *Mansonioides*).
taeniorhynchus, *Ochlerotatus* (*Aëdes*).
talaje, *Ornithodorus*.
talpoides, *Hemimerus*.
Tamius townsendi, *Ixodes angustatus* on, in Canada, **80**.
Talpa europaea, mites on, in Britain, **141**.
tapetzella, *Trichophaga*.
Tar Oil, for destroying house-fly larvae, **168**; for destroying mosquito larvae, **98**.
Tarentola mauritanica, **63**; reservoir of leishmaniasis in Algeria, **103**.
tarsalis, *Culex*.
tarsatus, *Eupelminus*.
tarsimaculatus, *Anopheles*.
tasmani, *Ixodes*.
Tasmania, *Stegomyia tasmaniensis* in, **183**.
tasmaniensis, *Stegomyia*.
Tatus novemcinctus, infected with *Trypanosoma cruzi*, **38**.
taylori, *Tabanus*.
Temperature, effect of, on ticks, **3**; on fleas, **4**; on bed-bugs, **91**; on lice, **50**, **57**, **87**; on flies, **62**.
tenax, *Eristalis*.
Tephrochlamys canescens, bionomics of, in Britain, **143**.
Terebinth, Oil of, in formula against mange on domestic animals, **178**.
terinus, *Callistopsyllus*.
terrestris, *Arvicola*.
territans, *Culex*.
tersus, *Ceratophyllus*.
tessellatus, *Anopheles*.
testor, *Neopsylla*.
Tetrachlorethane, effect of, on fly larvae, **141**, **167**, **168**.
tetripunctata, *Wohlfartia*.
texanus, *Ixodes*; *Ixodiphagus*.
Texas, a new *Phanurus* from, **122**.
Texas Fever, in Egyptian cattle, **193**.
thalassius, *Culex*.
Theileria, causing piroplasmosis in Egyptian sheep, **192**.
Theileria mutans, in cattle, **68**.
Theileria ovis, in sheep, **68**.
Theileria parva, causing Mediterranean coast fever in Libya, **14**, **69**.
theobaldi, *Anopheles*; *Ochlerotatus* (*Grabhamia*).
Theobaldia spathipalpis, anatomy of, **74**.
Thereva plebeia, in houses in Britain, **144**.
Thomomys bottai, *Ceratophyllus ignotus franciscanus* on, in U.S.A., **33**.
Thomomys talpoides, *Ceratophyllus ignotus recula* on, in British Columbia, **33**.
Thomomys talpoides agrestis, *Ceratophyllus ignotus apachinus* on, in Colorado, **33**.
Thryonomys, *Scipio* spp. on, in South Africa, **120**.
Thyridanthrax abruptus, parasite of *Glossina morsitans* in Nyasaland and Rhodesia, **29**, **116**, **118**.
tibiale, *Selasoma*.
Ticks, in Australia, **55**; and diseases of domestic animals in Brazil, **59**, **69**, **83**; in Britain, **142**, **194**; in California, **119**; on domestic animals in Canada, **80**, **122**; and disease in the Belgian Congo, **64**; and disease in Egypt, **7**, **192**; transmitting *Piroplasma* in the Gold Coast, **42**; infesting domestic animals in Guam, **191**; from French Guinea, **21**; importance of birds destroying, in Jamaica, **2**; and Mediterranean Coast fever in Libya, **15**; in Muscat, **173**; in Nigeria, **66**, **113**; and disease in Nyasaland, **170**; probably not carriers of leishmaniasis in Peru, **63**; in Queensland, **11**; and disease in domestic animals in Rhodesia, **44**, **46**, **73**, **108**, **171**; in Sierra Leone, **45**, **150**; list of, from Italian Somaliland, **69**; possible carriers of Kedani fever in Sumatra, **52**; blood-parasites carried by, in Tunis, **63**; on domestic animals in U.S.A., **13**, **58**; quarantine measures against, in U.S.A., **2**; conveying Rocky Mountain spotted fever, **154**; infesting fowls, **13**, **62**, **101**; bibliography of, **34**; new species of, **55**; monograph of, **34**; parasites of, **34**, **39**; control of

by dipping cattle, 3, 46, 73, 107, 160, 171, 192; destroyed by nitrobenzine, 79.
tigrina, Coenosia.
tigripes, Culex.
tigris, Felis.
Tigrisoma, Olfersia palustris on, in Brazil, 137.
tipuliformis, Culex.
Tinamus solitarius, Pseudolfersia eleagridis on, in Brazil, 137.
Tineola biselliella, in Scotland, 179.
titillans, Taeniorhynchus (*Mansonia*).
titillator, Cephalopsis.
Toads, experimentally infected with insect flagellates, 103.
torquens, Haematopota.
townsendi, Forcipomyia; *Tabanus.*
townsvillensis, Pericoma.
Toxorhynchites, in Principe, 49.
Toxorhynchites brevipalpis, predaceous on other mosquito larvae in Africa, 120; in French Guinea, 21.
Tracheomyia macropi, infesting kangaroos in Australia, 122.
tremula, Macleaya.
triangulata, Hodgesia.
triangulum, Neotabanus.
Triatoma, in Muscat, 172.
Triatoma geniculata, infected with *Trypanosoma cruzi,* 38.
Triatoma megista, relation of, to Chagas' disease in Brazil, 37.
Triatoma protracta, infested with *Trypanosoma triatomae,* sp. n., 181.
Triatoma rubrofasciata, relation of, to leishmaniasis, 102; not an intermediate host of *Leishmania donovani,* 174.
Triatoma sordida, relation of, to Chagas' disease in Brazil, 37.
triatomae, Trypanosoma.
tribulosa, Fahrenholzia.
Trichocephalus dispar, and houseflies in British East Africa, 54.
trichocerus, Demoplatus.
Trichodectes equi (see *T. parumpilosus*).
Trichodectes parumpilosus, formulae for control of, on horses, 178.
Trichodectes sphaerocephalus, serious loss of wool due to, in Australia, 111.
Trichophaga tapetzella, infesting stored deer-hides, 179.
Trichosurus vulpecula, Ixodes tasmani on, in Australia, 55.
triguttatum, Amblyomma.
trimaculatum, Amblyomma; *Hippocentrum.*
trinervis, Trupheoneura.
Trinidad, malaria and mosquitos in, 69; a new *Simulium* on equines in, 30.
trinidadensis, Megarhinus.
Trinoton conspurcatum, on geese, 13.
Trinoton luridum, on ducks, 13.
Triphleps insidiosus, attacking man in Illinois, 107.
triseriatus, Ochlerotatus (*Aëdes*).
tritaeniorhynchus, Culex.
trivittatus, Ochlerotatus (*Aëdes*).
Trombidium, carrying Kedani fever in Japan, 52; attacking man in Sumatra, 52; on turkeys, 13.
Trombidium holosericeum, control of, on fowls in U.S.A., 53.
Trombidium striaticeps, attacking man in France, 68.
tropica, Leishmania; *Piroplasma* (see *P. annulatum*).
Trupheoneura opaca, 51.
Trupheoneura perennis, 51.
Trupheoneura trinervis, 51.
Trupialis militaris, Ixodes auritulus on, in Tierra de Fuego, 55.
Trypan-blue, against tick-borne diseases, 59, 69.
Trypanosoma berberum, infesting domestic animals in the Sahara, 157.
Trypanosoma brucei, 42.
Trypanosoma brucei var. *rhodesiense,* in Rhodesia and Nyasaland, 18, 151.
Trypanosoma caprae, in *Glossina* and wild game in Nyasaland, 18.
Trypanosoma cazalboui, and *Glossina* in the Ivory Coast, 84; failure to infect *Cynonycteris straminea* with, 101; transmitted by *Glossina fusca,* 69; transmitted by *Stomoxys,* 67.
Trypanosoma congolense, in cattle in Africa, 67; transmitted by *Glossina fusca,* 68; failure to infect *Cynonycteris straminea* with, 101.
Trypanosoma cruzi, conveyed by *Triatoma* in Brazil, 37.
Trypanosoma dimorphon, in cattle in Africa, 67; and *Glossina* in the Ivory Coast, 84.
Trypanosoma equiperdum, 43.
Trypanosoma gambiense, not found in *Glossina* in the Ivory Coast, 84; and sleeping sickness in Nigeria, 66; infecting *Cynonycteris straminea,* 101.
Trypanosoma ingens, infecting *Cephalophus dorsalis* in Africa, 67.
Trypanosoma lewisi, in rats in Sierra Leone, 150; failure to infect *Cynonycteris straminea* with, 101.

Trypanosoma nigeriense, in cattle in Nigeria, **112**.

Trypanosoma pecaudi, in domestic animals in West Africa, **42**; transmitted by *Glossina fusca*, **68**.

Trypanosoma pecorum, in domestic animals in West Africa, **42**, **66**; in *Glossina* and wild game in Nyasaland, **18**.

Trypanosoma rhodesiense, possibly carried by *Ornithodorus moubata*, **44**.

Trypanosoma simiae, in *Glossina* and wild game in Nyasaland, **18**.

Trypanosoma triatomae, sp. n., infesting *Triatoma protracta*, **181**.

Trypanosoma vivax, in domestic animals in West Africa, **42**, **112**.

Trypanosomes, in domestic animals, **19**, **42**, **66**, **67**, **112**, **156**, **170**; in game, **18**, **47**, **67**; in rats, **150**, **181**; susceptibility of *Cynonycteris straminea* to, **101**.

Trypanosomiasis, in Eritrea, **192**; and *Glossina morsitans* in German East Africa, **47**; of stock in German East Africa, **48**; in domestic animals in West Africa, **42**, **66**, **151**; of domestic animals in the Belgian Congo, **67**; of domestic animals, associated with Hippoboscids in Eritrea, **156**; in cattle in Nyasaland, **19**, **170**, **171**; probably carried by *Glossina brevipalpis* in Nyasaland, **171**; and *Glossina* in Rhodesia, **77**, **108**, **151**; believed to be carried by Tabanids in the Sahara, **157**.

Trypanosomiasis, Human (see Sleeping Sickness).

trypherus, Silvius.

tscherga, Apodemus.

Tsetse-flies, distribution of, in French Equatorial Africa, **84**; distribution of, in the Belgian Congo, **35**, **56**; in the Gold Coast, **165**; trypanosomes found in, on the Ivory Coast, **84**; bionomics of, in Nyasaland, **28–30**; and trypanosomiasis in Northern Rhodesia, **118**; in Zululand, **121**; and big game, **77**, **114**, **115**, **117**; in relation to disease, **46**; parasites of, **65**; sodium arsenite suggested as a poison-bait for, **27**; use of dip against, **46**; a method of trapping, **130**; (see *Glossina*).

tuberculatus, Haematopinus.

Tunis, cattle from, nearly immune to Mediterranean coast fever, **15**; mosquito larvae in, **156**; *Rhipicephalus sanguineus* in, **63**, **121**; exanthematous typhus and lice in, **153**.

turicata, Ornithodorus.

Turkestan, *Argas persicus* infecting fowls with spirochaetosis in, **101**; new fleas from, **32**; *Gastrophilus inermis* in, **24**.

Turkeys, *Haemaphysalis cinnabarina* on, in Canada, **80**; infected with spirochaetosis by *Argas persicus*, **192**; parasites of, in U.S.A., **13**.

turkhudi, Anopheles.

Turpentine, formula containing, against mange on horses, **126**; in dips for protecting sheep from blow-flies, **71**; effect of, on larvae of *Wohlfartia magnifica*, **89**.

Tympanuchus americanus (Prairie Hen), *Haemaphysalis cinnabarina* on, in Canada, **80**.

Typha latifolia, larvae of *Taeniorhynchus perturbans* associated with, **170**.

Typhoid Fever, and house-flies in Gallipoli, **143**; incidence of, reduced by destruction of house-flies, **93**.

Typhus, transmitted by lice, **17**, **135**, **153**.

Tyroglyphus longior var. *castellanii*, causing copra itch, **46**.

Tyroglyphus siro, infesting house-flies in Britain, **146**.

U.

Uganda, mosquitos in, **120**; a new *Simulium*, from, **39**.

uliginosa, Mydaea.

Uloborus feniculatus, destroying mosquitos in Sierra Leone, **163**.

ululans, Ectomocoris.

umbrosus, Anopheles.

uncinatus, Enderleinellus.

unicavatus, Ixodes.

unicolor, Cryptotylus.

uniformis, Mansonioides (Taeniorhynchus); *Aëdes (Skusea).*

United States, diseases and parasites carried by dogs in, **58**; new fleas from, **33**; poisonous effects of *Macrodactylus subspinosus* on fowls in, **26**; Hippoboscids infesting birds in, **169**; bionomics and control of house-flies in, **5**, **181**; measures against importation of *Hypoderma bovis* from, into Australia, **73**; mites on rabbits in, **96**; mosquitos and their control in, **6**, **61**, **123**, **137**, **170**, **191**; mosquitos and malaria in, **53**, **76**, **77**, **90**, **92**, **136**, **152**, **175**; parasites of poultry and pigeons in, **12**, **53**, **166**; wool-maggots of sheep in, **1**; bionomics of *Simulium venustum* in, **81**; quarantine measures against ticks in, **2**; *Triphleps insidiosus* attacking man in, **107**.

univittatus, Culex.

Uranotaenia, in Queensland, **183**.

Uranotaenia albescens, in Queensland, **60**.

Uranotaenia alboabdominalis, breeding-places of, in West Africa, **112**.

Uranotaenia anhydor, breeding-places of, in California, **159**.

Uranotaenia annulata, breeding-places of, in West Africa, **66**, **112**, **150**.

Uranotaenia bilineata var. *fraseri*, in Nigeria, **66**.

Uranotaenia geometrica, rare in Brazil, **37**.

Uranotaenia nigripes, in Sierra Leone, **45**.

Uranotaenia nivipes, in Queensland, **60**.

Uranotaenia ornatus, breeding-places of, in Sierra Leone, **161**, **163**.

Uranotaenia propria, in Queensland, **60**.

Uranotaenia pulcherrima, in Brazil, **37**.

urbana, Mydaea.

Uta, probable carriers of, in Peru, **63**.

utae, Forcipomyia.

V.

vagus, Anopheles rossi.

variabilis, Dermacentor; *Lipeurus.*

variatus, Tabanus taeniola.

variegata, Phaonia.

variegatum, Amblyomma.

variolosus, Oestrus.

varipes, Pycnosoma (*Calliphora*).

Vaseline, against lice, **193**.

venustipes, Aëdeomyia

venustum, Simulium.

venustus, Dermacentor.

Ver du Cayor (see *Cordylobia anthropophaga*).

vermicularis, Oxyuris.

Vermijelli, against lice, **193**.

Vermipsylla hyaenae, on *Hyaena vulgaris* in Caucasia, **151**.

verrucarum, Phlebotomus.

Verruga, *Phlebotomus verrucarum* probably the only carrier of, in Peru, **65**, **123**.

versatilis, Pyrellia.

versicolor, Hippocentrum.

verticillatus, Docodon.

vespertilionis, Ixodes.

vestimenti, Pediculus (see *P. humanus*).

vestita, Cantharis.

vestitipennis, Anopheles.

veterinus, Gastrophilus (see *G. nasalis*).

vetustus, Tabanus.

vexans, Spaniopsis.

Victoria, a new *Ornithomusca* in, **159**.

victoria, Ornithomusca.

victoriensis, Culicada; *Ixodes.*

vigilax, Ochlerotatus (*Culicelsa*).

Villa lloydi, parasite of *Glossina morsitans* in Northern Rhodesia, **118**.

villosa, Calliphora (see *Pollenia stygia*).

Vinegar, against lice on domestic animals, **91**.

viridiceps, Anastatus; *Lucilia.*

viridis, Euglena.

Virulent Charbon, relation of *Simulium* to, **82**.

vishnui, Culex.

vitalii, Rangelia.

vittata, Haematopota.

vittatum, Simulium.

vivax, Plasmodium; *Trypanosoma.*

Viverra civetta, in Principe, **48**.

vomitoria, Calliphora.

Voria ruralis, in houses in Britain, **144**.

Vorticella, arresting development of mosquito larvae, **28**.

vulgaris, Phryxe; *Piophila.*

vulpecula, Ectenopsis.

Vulpes alpherakyi, *Ctenocephalus canis* on, in Caucasia, **151**.

Vultures, *Pseudolfersia vulturis* on, in Mexico, **138**.

vulturis, Pseudolfersia.

W.

Warble Flies (see *Hypoderma*).

Wart-hog, *Echestypus paradoxus* on, in Nyasaland, **171**; *Ornithodorus moubata* associated with, in Northern Rhodesia, **44**, **102**; infested with *Choeromyia* spp. in Senegal, **101**.

Wasps, infecting fruit with *Bacillus coli*, **145**.

Weasel, *Ixodes hexagonus* on, in Canada, **80**.

West Indies, *Dermatophilus penetrans* in, **5**; (see Jamaica, Trinidad, etc.).

willmori, Anopheles.

Wohlfartia balassogloi, distribution of, in Russia and Central Asia, **89**.

Wohlfartia intermedia, distribution of, in Russia, **89**.
Wohlfartia magnifica, bionomics of, in Russia, **88**; causing myiasis in cattle, **2**.
Wohlfartia meigeni, distribution of, in Europe, **89**.
Wohlfartia tetripunctata, distribution of, in Europe and Central Asia, **89**.
wolcotti, Olfersia.
Wood Rat (see *Neotoma fuscipes*).
woodi, Chrysops.
Worm-nodules, in cattle, caused by *Onchocerca gibsoni*, **8**; distribution of, **70**.
Wyeomyia grenadensis, sp. n., from Grenada, **64**.

X.

Xenopsylla, thick-tailed form of *Leishmania* not produced in, **174**.
Xenopsylla aequisetosa, on *Cricetomys gambianus* in the Gold Coast, **81**.
Xenopsylla astia, percentage of, on rats in Bombay, **75**.
Xenopsylla brasiliensis, percentage of, on rats in Bombay, **75**; on rats in Sierra Leone, **150**.
Xenopsylla cheopis, and plague, **4**; percentage of, on rats in Bombay, **75**; distribution of, on rats in Java, **128**; on rats in New South Wales, **182**; on rats in Nigeria, **66**; on rats in Sierra Leone, **150**.

Y.

Yellow Fever, and *Stegomyia fasciata* in West Africa, **66**, **149**, **150**, **165**; possibility of introduction of, into Australia, **59**, **135**; and *S. fasciata* in Ecuador, **149**; quarantine measures against, in the Gambia, **159**; campaign against, in Havana and Panama, **99**; danger of introduction of, into Morocco, **40**; distribution and control of, in the Tropics, **12**; dengue probably not a mutant of, **149**; uncertainty as to causal agent of, **150**; nature of immunity to, **109**.
Yokohama, use of rat-poison to control plague in, **154**.

Z.

Zalophus californianus (Californian Sea-lion), *Antarctophthirius microchir* on, **196**.
Zizania aquatica (Wild Rice), land covered with, not breeding mosquitos, **95**.
Zululand, new Anoplura from, **120**; *Glossina austeni* in, **121**.

NOTICES.

Secretaries of Societies and Editors of Journals willing to exchange their publications with those of the Bureau, are requested to communicate with the Assistant Director.

The Subscription to the Review is 12s. per annum, post free; or the two series may be taken separately, Series A (Agricultural) being 8s., and Series B (Medical and Veterinary), 5s. per annum.

All orders and subscriptions should be sent direct to the Assistant Director, Imperial Bureau of Entomology, 89, Queen's Gate, London, S.W. 7, or through any bookseller.

AUTHOR
TITLE.
NOV 24 1942
8—896

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01272 8796